BACKYARD BEARCAT—rubber to electric R/C conversion

MODEL Airplane NEWS

48120

ULTRA-TINY R/C GEAR IS HERE!

16 MICRO RECEIVERS pg. 32

KYOSHO
SUPER STEARMAN 40
The next generation of ARF?

Reviewed
- SR X610 electric glider
- Ohio R/C Extra 300
- Sig Somethin' Extra

November 1999
www.modelairplanenews.com

Construction:
RYAN ST



Tower .46 BB
True chrome ABC under $80

$4.95 CANADA $5.95
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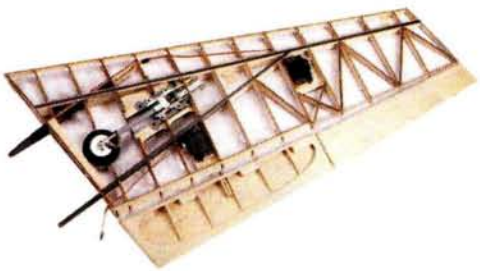
$900 less expensive. Fun to build. Superb performance.

Need any more reasons to consider a new balsa Bandit?

The composite Bandit's incomparable design and construction have earned it the reputation as the most rugged, highest performance, best-flying and easiest-to-land sport jet in the world.

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Editors GERRY YARRISH, DEBRA D. SHARP
Senior Editor CHRIS CHIANELLI
Associate Editor ROGER POST JR.
Assistant Editor BOB HASTINGS
Editorial Coordinator DANA DONIA

PUBLISHING
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Publisher YVONNE M. DeFRANCESCO
Associate Publisher SHARON WARNER

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CONTRIBUTORS
Bob Aberle, Dave Baron, Rick Bell, Joe Beshar, Bernard Cawley, Roy L. Clough Jr., Roy Day, Don Edberg, Dave Garwood, Dave Gierke, Henry Haffke, Greg Hahn, Tom Hunt, Michael Lachowski, Andy Lennon, George Leu, Mike McConville, Jerry Nelson, Jim Newman, Jim Onorato, Dave Patrick, Dave Platt, Randy Randolph, Jef Raskin, Carl Risteen, Jim Sandquist, Jim Simpson, Faye Stilley, John Tanzer, Craig Trachten, Rich Uravitch, Dan Wolanski, Nick Ziroli.

AirAGE

100 East Ridge, Ridgefield, CT 06877-4606 USA
(203) 431-9000 • fax (203) 431-3000
Email man@airage.com
Internet www.modelairplanenews.com

Member Audit Bureau of Circulations

PRINTED IN THE USA

MODEL Airplane NEWS

NOVEMBER 1999 • VOLUME 127, NUMBER 11

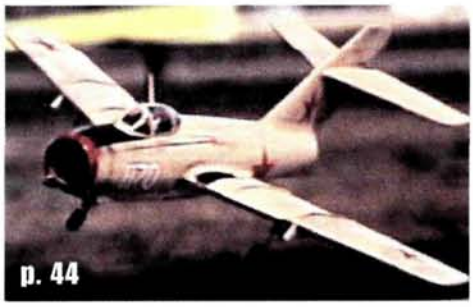
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MAIN COVER IMAGE: Chris Chianelli flies his Kyosho Super Stearman 40 ARF for the camera. This model is so well built that it redefines the category of ARF models (photo by Walter Sidas). Top inset: the Dumas 30-inch-span Bearcat is a great kit to convert from rubber to electric power. Tom Hunt shows you how on page 88. Lower right: Henry Haffke's latest creation, the Ryan ST, is featured in this month's construction article. Lower middle: the Tower .46 BB is a low-priced ABC engine that has more than enough power to please. Check it out in "Air Power" on page 100.

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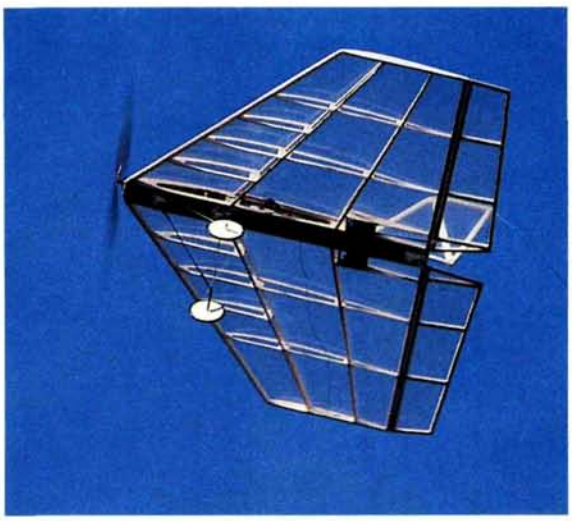
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Backyard R/C flying

Imagine sitting with a friend at a picnic table in your backyard. You are preflighting two tiny R/C aircraft that fly between 5 and 10mph for five minutes using 50mAh Ni-Cd batteries. These planes use the new breed of tiny R/C control systems. On cue, you and your friend launch the aircraft from the picnic table, and they fly a few laps around the yard. With the benefit of nimble thumbs on the transmitter gimbals, the diminutive racers flare for a landing on the very same picnic table. Two years ago, this would have sounded far-fetched. But the future has arrived, and such a plane is pictured here.



This DeltaSTAR 500, designed by WES Technik of Germany, distributed in the U.S. by David Lewis and built by contributing editor Russ Pribanic, weighs in at only 3+ ounces! It can be flown aerobatically for four minutes using 50mAh Ni-Cds, or for the better part of an hour using rechargeable lithium cells.

The editors of *Model Airplane News* are canvassing this new arena to bring you the latest in this exciting trend. This issue, Bob Aberle reviews 16 micro receivers currently on the market; see page 32. These units "plug and play" with tiny speed controls and proportional servos developed by forward-thinking companies—some of them quite small (but impressively innovative!). Park flyers and slow flyers have been the rage in recent months. Now a new, slightly more diminutive cousin is in the skies, and we think it's here to stay: the backyard flyer!



Sky Hooks & Rigging's RX72 H 4-channel micro receiver has an integrated ESC and weighs only 4 grams.

Such tiny aircraft need to be flown on windless days, of course, or indoors. On the other hand, slightly larger aircraft, such as the 11-ounce, free-flight-to-electric conversion of the Dumas Bearcat by Tom Hunt (see page 88), can penetrate a mild breeze. If you think about it, most free-flight kits designed for rubber or CO_2 power are now relatively easy to convert to great-flying R/C mini-electrics, and the smaller of them requires a flying area about the size of the average yard. You can learn to fly using an R/C flight sim such as Great Planes' "RealFlight," then build an airplane using micro-size control components and fly the completed project without ever needing to jump in the car for a trip to the flying field.

Some of these tiny planes are highly aerobatic. What about combat? Or scale? A 1/48 fun-scale B-17 would have a wingspan of about two feet. Although certain liberties might have to be taken to ensure flyability, emerging technology is finally making such tiny scale projects practical. *Model Airplane News* will keep you posted on every facet of this exciting new trend.

THERMALING AT MINUS 38.2 DEGREES FAHRENHEIT?!

On Saturday, November 21, 1998, John Penney became the first person to fly an R/C aircraft at the South Pole. The wind was blowing at 7 knots, and the temperature was -38.2 degrees F. John was flying the new SR X610 electric sailplane using the SR Sport Power system; the X610 is reviewed on page 52. John's record flight will be listed in the 2000/2001 edition of the Guinness Book of World Records and will be detailed in one of our upcoming issues.



Standing next to the South Pole, John Penney holds his record-setting SR Batteries X610 electric-powered glider.

JETS ARE ZOOMING

New technologies and product lines are springing up in the jet segment of our sport at a surprising rate. Miniature turbine jet engines and even electric jets are emerging at breakneck speed, as are developments in traditional ducted-fan power systems. On page 44 of this issue, Frank Tiano provides an update on ducted fans.

A Hero

DR. LOUIS DEFRANCESCO 1923 - 1999

Our father was a hero. He loved his family and served his country, and his beautiful spirit touched the lives of so many people, including those in the R/C industry.

When our father greeted you, you were always assured of a warm smile and a sincere handshake; his kind eyes seemed to peek into your soul. People always remembered him and he remembered them; he always had time to listen.

From the early '50s, when he could be relied on to take the train from New York to attend the annual Hobby Industry of America show in Chicago, he supported the industry and inspired those who shared his vision. His foresight was manifested in many ways: he recognized the value of R/C as a very creative hobby and supported the inauguration of big events that brought the hobby to the general public. The Las Vegas Tournament of Champions, which is now *the* event on the R/C airplane calendar, was created by Louis and Bill Bennett, president of Circus Circus Hotel and Casino, Las Vegas. He was well-known and well-liked throughout the hobby and a close friend of many of the hobby's "originals"—the founders.



Doc with his grandson Emil at the workbench.

He supported all of our magazines and, never afraid to take risks when presented with a new idea, he always encouraged innovative ventures. He shared our determination to publish high-quality R/C magazines and books.

Those who have worked with us at Air Age for many years well remember his kindly presence and the interest he took in them and their families. They also remember his cooking! Lunch was often quite an event!

But where did this all start? Like so many immigrants before him, yearning for freedom, as a boy, my father stepped onto Ellis Island with just a small suitcase and a dream. Yet throughout his life, his heritage was never forgotten. Everyone who knew "Doc" knew he loved life—especially all things Italian: its art, beauty, culture and rich history. This was expressed through his painting, sculpture, travel and his often memorable culinary endeavors.

After being in America for only a few short years, he proudly rose to the call of his country, spending almost three years in combat, both in Europe, where he participated in the D-Day invasion, and in the Pacific, during the battle of Okinawa. He earned decorations for his valor and his wounds, including the Purple Heart.

Despite nearly losing his life and enduring unimaginable pain, the darkness of war never daunted his spirit, and he made a career of bringing beautiful smiles to people's faces. For kids, a trip to the orthodontist with "Dr. D" resonated with warmth and laughter.

And our father's gift of bringing smiles was not limited to his professional practice. As a husband and father, he stood by and guided his family with love, compassion and understanding. There was always an abundance of affection as well as forgiveness—a true hero by example.

Even though presented with some of life's deepest adversity and loss, we often heard him say, "In life, there's hope."

His heroism spanned three generations, and his loving example found its way into the hearts of his grandchildren, whom he so cherished. He beamed at even the slightest mention of them, and he loved their shenanigans!

Many people have told us that they always heard our father described as a "true gentleman"—and a *gentle* man.

And though words could never adequately describe all that Dr. Louis DeFrancesco embodied to so many people in so many walks of life, we are convinced that the legacy he wanted us to continue is one that reflects timeless values—hope, love, passion and heroism.

His warm presence is so missed.

—Louis and Yvonne DeFrancesco, August 1999

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

AIR SCOOP



BY CHRIS CHIANELLI

Gold Edition Enters Golden Age

Does the word "reliant" conjure visions of an old Chrysler "K"-car? Or does the image of a beautiful vintage Stinson enter your mind's eye? If you've ever had your hands on one of the Top Flite Gold Edition kits, you'll share my enthusiasm for this latest release: truly a scale masterpiece—Top Flite's 1/5-scale Stinson Reliant.

This all-wood beauty is the kind of kit that makes me and my scale compadres giggle with delight. The fuse bottom, wing and tail feathers are built flat on the board, and there are lots of interlocking components to ensure a straight framing.

Before you say that you don't have a tractor trailer to cart this 100.5-inch-span bird around, hear this: the two-piece wing allows easy transportation. The cowl, wheel pants and fairings are ABS plastic, and further scale enhancements include a scale interior kit. Power choices include a 1.08 to 1.99 2-stroke, a 1.2 to 1.6 4-stroke or 23 to 35cc gas engines. Figure you'll need a 5-channel radio to run with flaps, and the kit calls for independent servos on each control surface. I have my CA ready!





Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; website: www.greatplanes.com.

MODEL TECH'S Su-29



If you like slow and lazy R/C planes to putt around your backyard in front of an audience of squirrels, don't read this "Scoop." On the other hand, if you'd like high-speed loops, rolls and spins with a cool-looking Russian hot-rod that can be built in a day, read on.

Model Tech's Sukhoi Su-29 .46 is not only designed for aerobatics, but it also has a wing loading of 19 to 21 ounces per square foot for good low-speed characteristics. Designed for .40 to .46 2-stroke or .52 4-stroke power, the Suk comes as an all-wood, scale-like contoured airframe covered with iron-on polyester covering. The "kit" features a painted fiberglass cowl, formed-aluminum landing gear, steerable tailwheel and an extensive hardware package.

Model Tech; distributed exclusively by Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452

Cold-War Cub



Want to put an end to the size-escalation war once and for all? Do what B.B. Weber did and make your own 21-foot-plus Russian Tu-95 Bear bomber from enlarged Don Smith plans. There might be *larger* models, but this is truly a work of engineering art. At 90 pounds, this 1/10-scale behemoth weighs as much as a year-old Great Dane, and is just about the same height, too (4 feet, 3 inches)! Inside are a veritable hobby shop of Futaba radio gear, including 28 servos, 25 switches, 16 batteries and three receivers!



Each of the twin 1.8 4-strokers has its own remote starter à la Brookside Machine—the same folks who supply the wheels and air brakes for the project. The Robart retracts require three separate air systems to function. Specs: wingspan—21 feet, 6 inches; length—18 feet, 7 inches; wing area—4,000 square inches. No word yet as to how the contra-rotating props are handled. My spies were dispatched to capture its rumored appearance at the Big Bird Fly-In down in Texas, so keep watching!

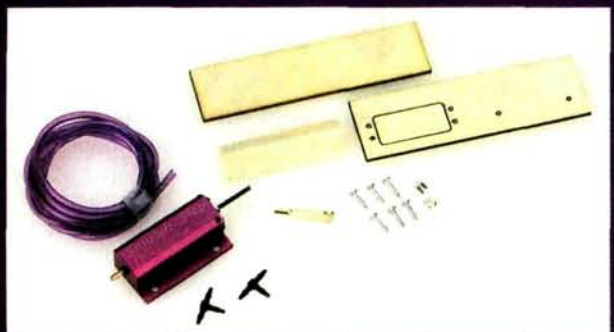
The Latest Buzz from AP Engines



Following Randy Randolph's very favorable review of AP's .09 Hornet in the August issue, this new, larger-displacement AP will no doubt turn some heads, as it, too, may prove to be a powerhouse. Like the Hornet, the Yellowjacket .15 R/C has hard-chrome ABC construction, front rotor induction, Schnuerle porting, dual ball-bearing-supported crankshaft and is made with aerospace-quality materials on CNC machines; in fact, it will probably last longer than a Christmas fruit cake.

AP Engines; distributed by Global Hobby Distributors, 18480 Bandilier Circle, Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

BVM Smooth Stop



"OK; who has been leaving those skid marks on the tarmac, huh?" No longer must you fear the scolding of your club's "field marshal" because you can now have Bob Violett Models' (BVM) Smooth Stop brake valve. What makes this system the hot ticket is that you can have completely proportional braking action with your BVM or similar brake system, and it doesn't put any load on your brake servo at any setting—even with 65psi of brake pressure. The valve is small enough to be used with virtually any scale project, and it can be run off the same reservoir source as your retracts. It's also extremely light—only 2½ ounces with a servo. Each application uses 1 only to 2psi of pressure. If you need more stopping muscle, run a separate air-tank line to it and increase your brake pressure to 85psi.

Bob Violett Models, 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020.

A Call to Instant Action!



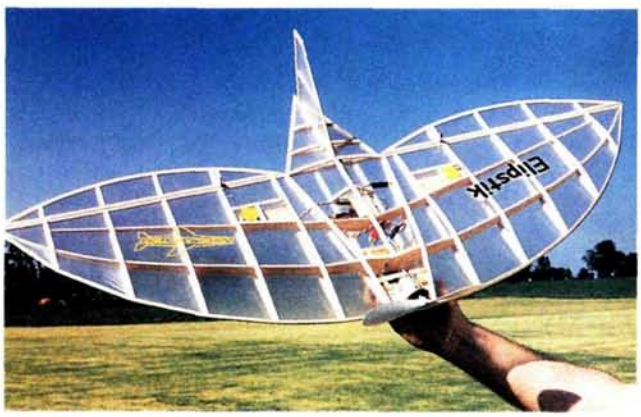
For the instant-gratification types, and, to be fair, for those with extremely busy schedules, the gang at Hobbico now makes entry to R/C flying almost effortless with the introduction of the new Action Series, which includes the Sun Pilot and the Zoom Pilot.

This series offers new pilots completely assembled, ready-to-fly, 2-channel airplanes, and there's no need to buy additional accessories. The radio takes care of the rudder and electronic speed control; you preset the elevator to adjust your climb rate prior to flight. As the battery power is discharged in flight, when the voltage drops to a preset level, the motor automatically shuts down and the remaining juice allows the airplane to be glided back to land.



New pilots will appreciate the instructional video, and the package also includes two rechargeable batteries, an AC wall charger and the only required tool—a screwdriver. Sounds as if they've thought of everything!

Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008.



MODELAIR-TECH'S Oddball

Check out this little creature. It's the newest brainchild of Tom Hunt and Modelair-Tech. The "Elipstik," as they call it, needs three channels for aileron, elevator and motor, and with a 7-cell 350mAh pack and MAT GD-280 3:1 geared motor, it can fly for up to 10 minutes.



Hook up a MAT M-50 400-size motor with a Gunther 7x6 prop and a 6-cell 500mAh, and this baby will really cook. For $53.95 (plus S&H), you can pick up this kit with the GD-280 and prop and still have some cash left over for lunch.

Modelair-Tech, P.O. Box 1467, Lake Grove, NY 11755-0898; (516) 981-0372.

MetamorphaBee







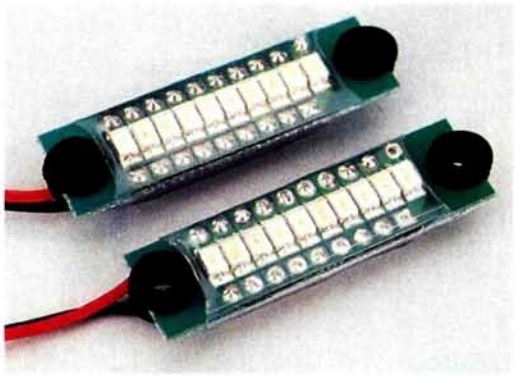
There's no mistaking the classic lines of the Clancy Aviation Lazy Bee. I'm sure you've seen them here in the magazine and at the field. Whether you like their looks or not is completely unimportant (I love them); what *does* matter is that Clancy designs are terrific fliers. Now, beyond the Big, Lazy and Speedy Bees, there are new variations that are sure to attract more fans to the hive ... er, fold.

Clancy's 29-inch-span Yard Bee is a perfect first kit/first plane. Make it a glider or power it with an electric Speed 400, CO_2, or .010 to .10 glow. But wait; there's more buzz from the Clancy hangar: this new, 27-inch-span, two-wing Bee—the Stagger Bee—was designed by SMALL cofounder Joe Wagner. Makes you kinda wonder what's next. How about a FanBee or a MayBee? Nah.

Clancy Aviation, P.O. Box 4125, Mesa, AZ 85211-4125. (480) 649-1534, fax (480) 649-9040.

On Voltage Vigil

Are you the type who's constantly stressed out about voltage?—always hunting for that magically disappearing voltmeter? Well, I guess if you have to worry about something, onboard battery voltage is actually a good subject to do some hand-wringing about—that is, of course, unless you never fly!



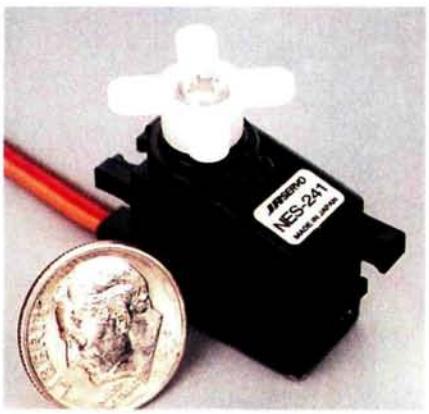
Well, Expert Electronics has come up with a great solution for those of us so afflicted. Why not just mount a battery-monitoring meter in the plane or on its outside? How simple and great an idea is that?!

This little device measures 1½x7/16x1 1/32 inches and weighs only 0.25 ounce. Mount it anywhere on a flat surface, and you'll have an easy-to-read, full-time battery-status monitor right on your plane. Call it an air-traffic light, if you will: green means "Go"; yellow means "Caution"; red means "Don't go anywhere except to find a charger"! Talk about a stress-reducing device!

Expert Electronics; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511.

Small Fry

Imagine a servo that could put out as much torque as a standard-size servo yet would weigh only 0.32 ounce. OK; now imagine that it has a JR logo on it and its model number is 241.



Well, here's the proof that imagination isn't just about daydreaming: the brainstormers at JR have designed just such a device.

With a size of 0.45x0.85x0.87 inch, this little critter could fit pretty much anywhere you'd want and not make much of a difference to your all-up weight. Now, if someone would only invent pizza that does the same thing

JR; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511.

AIRWAVES

Our readers write back

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *MODEL AIRPLANE NEWS*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.



WOOD WEIGHTS

Here's a stupid question. How do you determine if balsa is medium or hard? Is this a factor of, or related to, weight? Or is it actually how hard it feels. I just have to say that I am starting to build your Nifty 80 from the *Model Airplane News* plan FSP10932 as my first scratch project. Thank you.

[email]
DAVID KUMMER

David, the only really stupid questions are those you don't ask. Hard, medium and soft balsa can be determined by feel, but weighing the sheets on a gram scale is a lot more accurate. Balsa hardness is also indicated with an "ABC" grading system, "A" being very light with a soft grain and "C" being very hard and heavy. Strength is relative to the wood's hardness; light, soft wood is less strong than heavy, hard wood. The hardness is related to the wood's weight measured in pounds per cubic foot. A-grain is about 4 to 6 pounds per cubic foot, and C-grain is 8 to 12 pounds per cubic foot. Medium B-grain is somewhere in between. Visually, A-grain balsa is very clean and smooth with almost no grain showing. B-grain has a more defined grain pattern, and C has a very coarse grain pattern. You can check hardness with the "thumbnail" test. Soft, light A-grain is easily dented when you push your thumbnail into the wood, and some very hard C-grain balsa will be very hard to dent; almost no mark is left when you try to push your thumbnail into it. For general sport building, I prefer B-grain, as it is good for ribs, bulkheads and sheeting. Stick balsa for spars and stringers and flat, built-up tail surfaces should be C-grain (but not a super-hard C-grain in the tail). Spars and stringers should be very hard for strength.

Hope this helps. *GY*

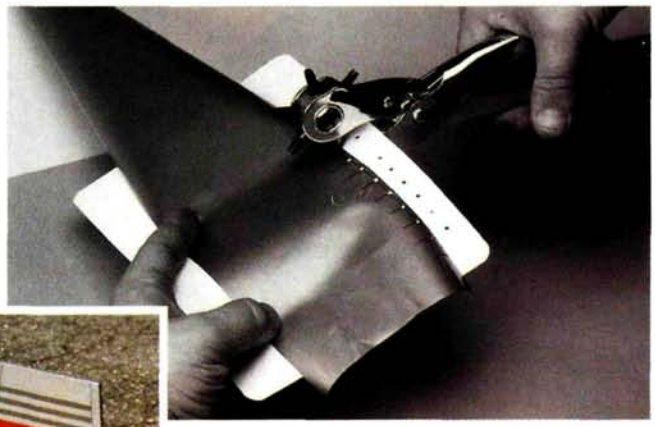
NEW TO R/C

I've enjoyed building plastic, non-flying scale models for many years now, but I've balked at getting involved with flying models, as I dislike the noise that 2-stroke engines are notorious for. But I've been reading your magazine for some time and have followed the progress made in electric R/C flight. Could you recommend the best way to get involved in the hobby if you've never flown R/C aircraft before? Also, do you know of anyone who produces plans or kits of the Fairchild F-22? It was a beautiful, open-cockpit, parasol-wing aircraft of the 1930s. I read somewhere that Flyline Models used to produce them, but I can't find any info on that company.

NEIL HODGINS
Whitby, Ontario

If you are new to R/C and also want to start with electric power, the best way to begin is by contacting Tom Hunt at ModelAir-Tech. You can reach him in the evenings at (516) 981-0372, or email him at THunt95147@aol.com. By all means, check out his website at www.modelairtech.com.

Tom can recommend one of his simple, stick-construction, trainer-type aircraft that will fly slowly enough to give the beginner a chance to learn all the techniques. The models take little time to construct and are very inexpensive. Once you've learned the basics, you can look into the likes of a Fairchild F-22.





My book titled, "Clean & Quiet—A Guide to Electric Powered Flight" is available from Tom for $11; it provides a good starting point into electric-power R/C. *Bob Aberle*

GREAT BALLS OF FIRE

In the September '99 issue of *Model Airplane News*, reader Al Cooper writes that he cannot find plans and/or information for the Ryan FR-1 Fireball. I am a small operator who designs and sells R/C plans, and I have a 1/12-scale plan available for this model. If he would care to contact me, I would be pleased to send him my plans catalog, which includes the Fireball.

The Fireball has a "first" that Al did not mention. It was the first airplane to land on a carrier while under jet power. In training, during a routine landing approach, the nose-mounted Wright Cyclone radial cut out, and the Fireball continued down under the power of its G.E. turbine to a successful carrier landing.

[email]
GUS MORFIS

Gus, thanks for your help. Because we received quite a few more letters about the Ryan Fireball, I wanted to include the address for your plans service in "Airwaves." Here it is: Gus Morfis Plans, 4709 Green Meadows Ave., Torrance, CA 90505-5507; (310) 378-5679. *DS*

MONOKOTE RIVETING TOOL

I read with great interest Faye Stilley's panel-line article in the September '99 *Model Airplane News*. He mentions a hole-punching tool made by Synthesis that costs about $12. The article said that manufacturer info could be found on page 134 of the issue, but I couldn't find any info about Synthesis there. Can you give me any info?

[email]
DAVE HABLE

Dave, you're right; Synthesis was accidentally omitted from the September '99 "Index of Manufacturers." If you'd like to order this handy tool, send a $12 money order to Synthesis at 24 Serendipity Ln., Wilton, CT 06897. Shipping and handling costs are included in this price. We apologize for any inconvenience this may have caused. *DS*

PILOT PROJECTS

A look at what our readers are doing

SEND IN YOUR SNAPSHOTS. ***Model Airplane News*** **is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.**

All photos used in this section will be eligible for a grand prize of $500, to be awarded in early 2000. The winner will be chosen from all entries published in 1999, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.



MT. FUJI FLIER

Reader Kazuo Kai of Yokohama, Japan, says you might see this naval type 96 carrier-borne fighter model cruising the skies near Mt. Fuji. Kazuo's 1/6.5-scale project has a wing loading of 24.9 ounces per square foot, a wingspan of 66 inches and length of 45 inches. A Zinger 12x6 propeller is turned by an O.S. .61 SF engine. Aluminum, dark red, white and black MonoKote were used for the finish.



TIGER TRAINER

While teaching yourself to fly a model helicopter, you might as well create a trainer with style. That was the thinking of Don Paulson of Napanoch, NY, when he tiger-striped his Kyosho Nexus 30 using automotive-grade paints over a coat of thin CA. Having started out on a CSM flight simulator before switching to the real thing, Don remarks, "So far, no problems."

GYRATION



Gordon Fairley of Keizer, OR, built this 3.5-pound Gyro Bee and powered it with an O.S. .26 FS 4-stroke engine. Vinylwrite Co. of Granada Hills, CA, made the lettering that completes the Steve Tillson kit, which is offered by the Autogyro Co. of Phoenix, AZ. Recently completed, this autogyro is expectantly awaiting its first flight, which Gordon assures us is forthcoming.



BEECHCRAFT BARON

This Beechcraft Baron 58p was crafted by Michael Beckman using Al Strickland plans. Michael installed navigation lights, landing lights, sequencing gear doors and onboard glow lights, along with the usual gadgets, all of which are controlled by an Airtronics Stylus radio with 10 servos. Michael spent the 14 months needed for construction working in an 8x10-foot shed in Whitmore Lake, MI.



ITALIAN ACE

Henry Bertoja wrote to tell us about his friend Franco Trento from Padova, Italy. A longtime modeler now in his 60s, Henry's friend built this Spitfire as his first project and designed it using only a 3-view outline. Because he didn't feel that his plane was worthy of being published, Franco declined to send us a picture, so Henry took it upon himself to do just that. Minutely detailed, this SuperTigre 3500-powered model has a 90-inch wingspan, weighs slightly more than 20 pounds and stands as proof that kits are only a beginning.



GOOD KNIGHT

Bob Kelley of Middleburg, FL, built this 1/3-scale Imperial Knight Twister from Dan Santich plans. An O.S. 2.40 FT engine powers this 16-pound craft during flights that Bob says are "very fast, yet gentle at landing speeds, with no bad habits." The model also features composite materials and carbon fiber.

POLKA DOTS OVER PA

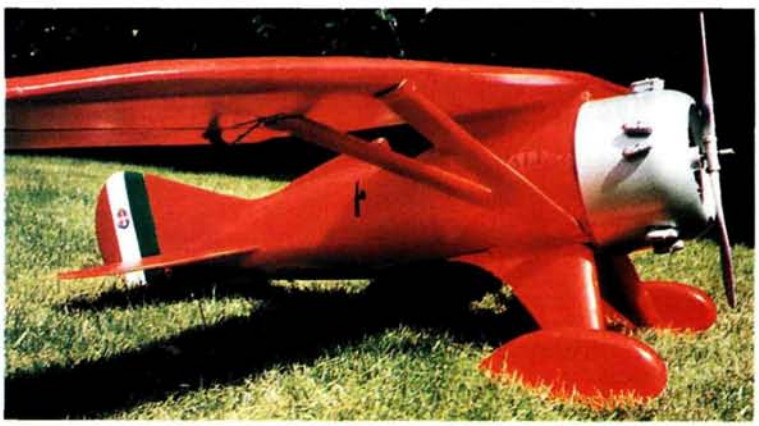
More than 350 MonoKote polka dots swarm over every surface of Gene Poremba's Giant Aeromaster. The annual Biplanes over Pennsylvania meet was the driving force behind the construction of this spotted machine, which Gene says "is one of the most photographed models at every event." Be on the lookout for Gene's plane in the skies above Pine Forge, PA.



OH, BABY!

The February 1999 issue of *Model Airplane News* included the construction project of a Sopwith Baby, which has been painstakingly replicated by James Meikle of Peekskill, NY. To obtain the proper CG, Jim mounted 36 SR 1700mAh batteries inside the cowl. The 22x14 prop and two Modelair-Tech belt-driven motors give the necessary thrust to this 16-pound warbird. After giving thanks for SR's custom work, Jim adds, "It flies great!"





RED DEVIL

Fortuna, CA, modeler Robert Nessler scratch-built this 1/6-scale version of a 1937 Piero Magni Vale using only a little history and the full-size specs. The 42-inch-long plane has a wingspan of 60 inches and is powered by an O.S. .60 FX engine spinning a 13x5 prop. Like the full-scale airplane, the model was skinned in ply before being painted with LustreKote. Robert thanks Elisan Lautt of Sacramento, CA, for the full-body DGA pilot figure that can be posed inspecting the plane or seated in the cockpit.



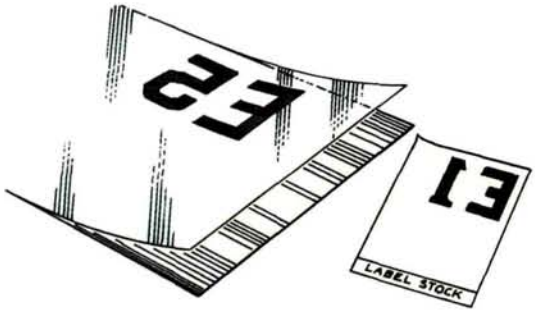
JERSEY HELLCAT

A sliding canopy, hand-carved static prop and operable wingtip lights are just a few of the attributes of this F6F-5 Hellcat built from plans drawn by Michael Garze. Working at his home in Edison, NJ, Michael refused to use decals, so he created all of the details with paint. He credits a civilian airshow plane in California for the paint scheme. Weighing in at 34 pounds, this Navy-marked model also features two servo-controlled cowl cooling fins, fully sliding flaps and a handmade cockpit with operable levers.

HINTS & KINKS

BY JIM NEWMAN

SEND IN YOUR IDEAS. ***Model Airplane News*** **will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.**

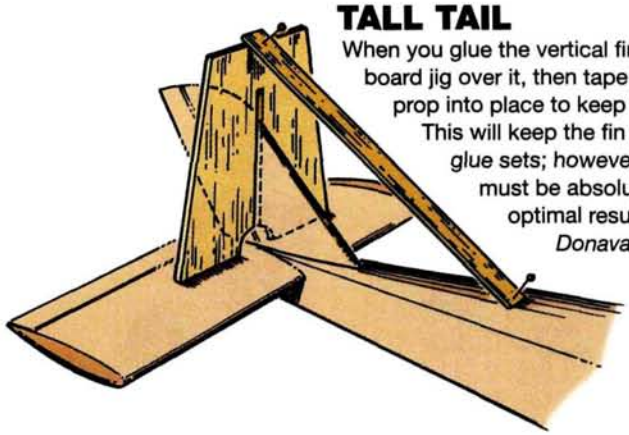


DIGI-DECALS

Using your computer, print out reversed (flipped) numbers onto sheets of label stock, then attach them to the clear backing of your covering film. You can then cut around those images to produce iron-on AMA numbers, etc.

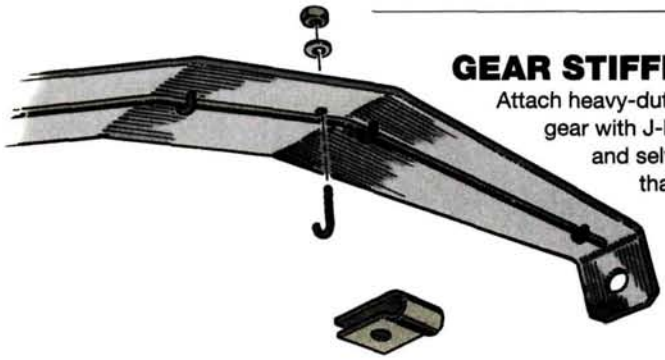
Rick Clark, Berkley, MI

TALL TAIL



When you glue the vertical fin, fit a slotted cardboard jig over it, then tape or pin a cardboard prop into place to keep the jig vertical. This will keep the fin straight while the glue sets; however, the stabilizer must be absolutely horizontal for optimal results.

Donavan Haines, Vista, CA



GEAR STIFFENER

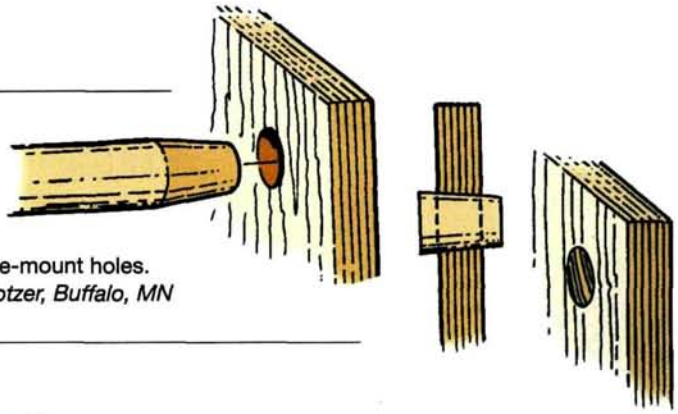
Attach heavy-duty music wire to the underside of your aluminum landing gear with J-bolts or thin, steel P-clips attached with screws, washers and self-locking nuts. This works well if your landings are less than gentle!

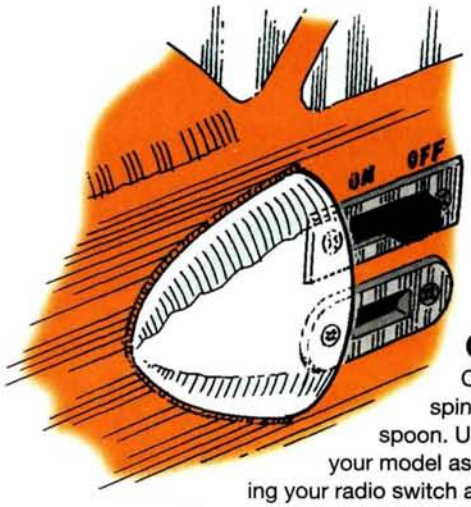
Louise Cadieux, Lincoln, RI

GIVE IT A PLUG

To fill holes in your firewall, glue tapered dowels into them. Once the glue has set, saw off the excess dowel and sand it flush. Finish by applying epoxy for fuel-proofing. This is a great tip when you need to move engine-mount holes.

Jeff Krotzer, Buffalo, MN

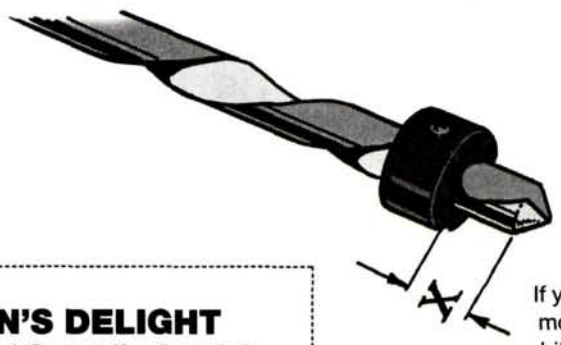




OIL BARON'S DELIGHT

Cut this plastic oil deflector off a discarded spinner package or the tip of a large plastic spoon. Use canopy glue to attach it to the side of your model as shown, and it will prevent oil from entering your radio switch and charging jack. This is especially worthwhile if they are mounted on the exhaust side of the model (a no-no!).

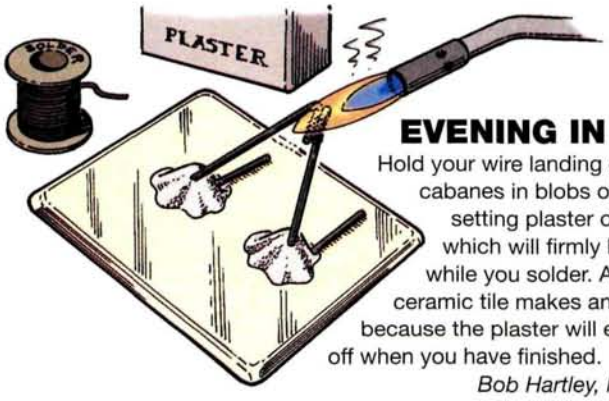
Andrew Kramar, Corona, CA



PRESET DRILLS

If you have multiples of your most frequently used drill-bit sizes, attach depth stops to them to speed construction and eliminate tedious setup. Place a wheel collar on the bit at the required distance from the end height (X).

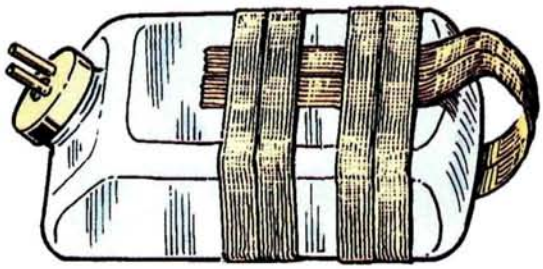
Tom Messing, Cheektowaga, NY



EVENING IN PARIS

Hold your wire landing gear or cabanes in blobs of rapid-setting plaster of Paris, which will firmly hold them while you solder. A piece of ceramic tile makes an ideal base because the plaster will easily come off when you have finished.

Bob Hartley, McAllen, TX



TANK TUGGER

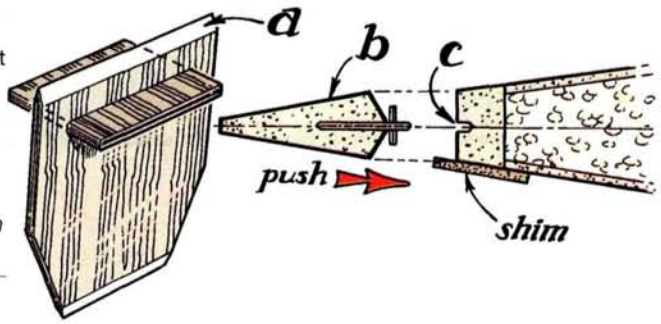
Thoroughly clean the outside of your fuel tank, then wrap it with packing tape as shown. The newly created handle makes it easy to maneuver and remove the tank.

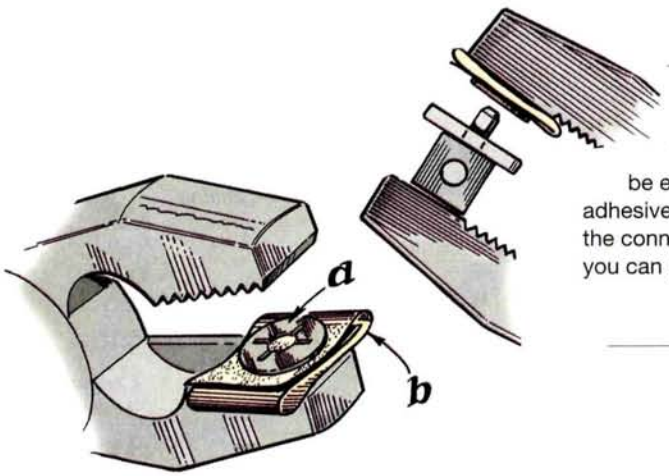
Norman Hetfield, Stevensville, MI

HINGE-SLOT MARKER

Make this dummy hinge out of 1/32-inch (0.8mm) plywood by first sanding a sharp bevel (a) into the ends of the hinge blade. Be sure to accurately slot the control surface (b) while inserting the false hinge, and push it firmly against the wing trailing edge. Rest the hinge on the shim strip correctly, and you will get an accurately positioned indent on the wing's trailing spar (c).

Kenichi Yarita, Kasukabe, Saitama, Japan





MINI PRESS

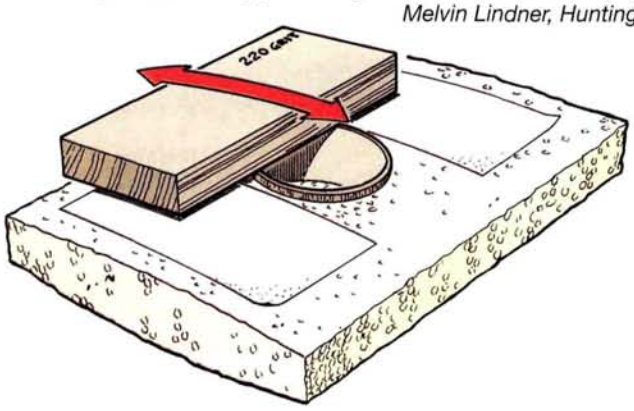
The press-on retainers (a) used with some pushrod connectors can be easily attached by using a pair of pliers as a mini press. Place rolled adhesive tape on one jaw of the pliers (b) to keep the retainer in place. Hold the connector with the pliers, and squeeze to start the retainer moving. Now you can push the retainer all the way down the connector's stem.

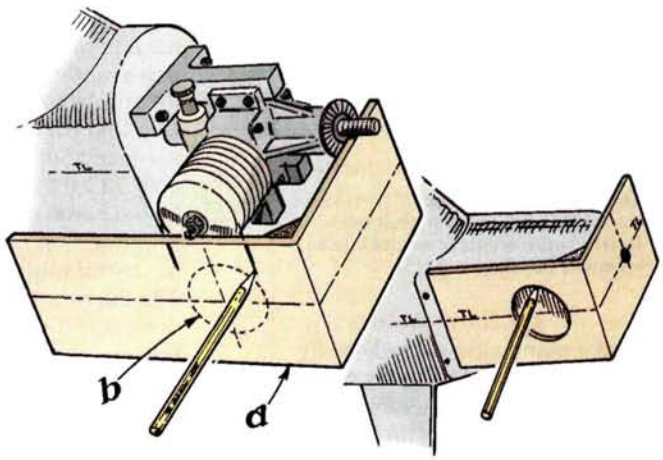
Chris Archie, Beaumont, TX

SANDING PROTECTION

Before sanding a wooden wheel-well liner, place a sheet of paper over the foam-core. The paper will slide back and forth with your sanding block, thereby protecting the foam from the sandpaper.

Melvin Lindner, Huntington, NY





CARDBOARD COWL CAPER

Bend and glue stiff cardboard at a 90-degree angle, then hold it as shown to mark the cylinder-head position (a). Next, cut out the head clearance circle (b) and remove the engine. Attach the cowl and tape the template to it; make certain that it is aligned with the premarked thrust lines. Finally, draw the position of the head-clearance hole on the cowl, and it's ready to be cut out.

Steve Aldridge, Boise, ID



MODEL AIRPLANE NEWS

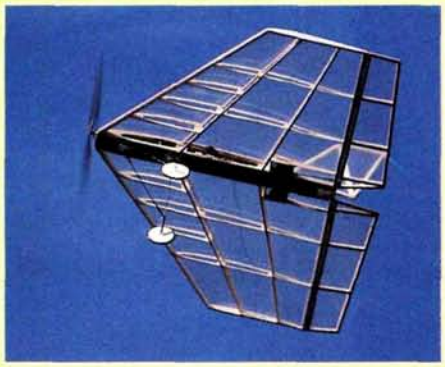
Guide to MICRO

by Bob Aberle

IF YOU HAVEN'T already heard, some R/C modelers are coming indoors to beat the heat, wind, snow and freezing conditions and enjoy the thrills of a new hobby: indoor, micro R/C flying. Others are staying close to home to enjoy a few quick, after-dinner flights at local parking lots and athletic fields, and sometimes, even in their own backyards. The key ingredient that makes all this possible is the new breed of micro R/C components now on the market. Surprisingly, much of this equipment has been developed by individuals and small companies, so finding and choosing the right product for the job may prove difficult because many of these folks can afford little or no advertising.

To help modelers who are interested in the new generation of very small aircraft, we gathered samples of all the micro-size R/C receivers we could locate, surveyed the individual features of each and then photographed them so we could present our readers with this product guide. In future issues, we plan to look similarly at microservos, micro-electric-motor speed controllers, tiny electric motors, and last, the kits and ready-built models that will ultimately use these micro-components.

For the purpose of this survey, we defined a micro R/C receiver as one weighing ½ ounce or less, although, as you will see, we took certain liberties with that figure. Individual write-ups and photos will provide the details of each micro receiver, along with a list of the names, addresses, phone and fax numbers, email addresses and websites for all the manufacturers, distributors and suppliers.



Please keep in mind that many of these tiny receivers are not what we would call "full-performance" types. In other words, some may not be capable of operating in a narrowband environment with adjacent channels only 20KHz away from one another. Some of these tiny receivers may also have somewhat limited radio ranges. These will work best when operated with similar equipment, i.e., gear designed for micro aircraft that fly indoors, in backyards, at local parking lots and schoolyards, etc. You probably would not want to operate some of this equipment—those receivers that are not narrowband—at busy flying fields where all 50 R/C aircraft channels are regularly used.

Another word of caution involves flying in an indoor facility, such as an auditorium or gymnasium. If you fly during daylight hours, your signals generated indoors might interfere with the signals of fliers outdoors, if there are flying fields nearby. Be very careful of that prospect; to be on the safe side, fly after dark.

Also note that all R/C receivers—in fact, any RF-generating device—must be certified to comply with certain FCC regulations to be certain it won't interfere with other electronic devices. Before you buy your new micro R/C receiver, it is best to ask the product's manufacturer or distributor whether a compliance form for it is on file with the FCC. In this survey, we have made an effort to include only receivers that are FCC-compliant. As tiny as these receivers are, they must still be certified.

Common sense will tell you that limited production—in some cases, hand-made units—and tiny size can lead to some large price tags; see our comparison chart to get a sense of the varying prices of the receivers now available.

After reading all about these micro R/C receivers, you may wish to keep up with the constantly improving technology. To do so, we suggest you subscribe to the Slow Flyers listserve, a free, email-based service to modelers offered by *Model Airplane News*. We've included instructions on how to quickly join this fine network of dedicated micro R/C pilots.

Now, on with the report!



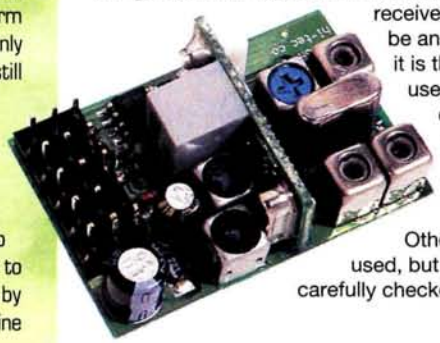
FMA Direct "Tetra"

One of the "heavier" units in this group, it weighs in at 0.5 ounce (14g) and measures 2⅛x¾x½ inch. This is a 6-channel function, single-conversion, full narrowband, performance-capable receiver that is available on all 72MHz R/C channels and on the 50MHz (6m) R/C channels, FM as well as AM. A series of five dipswitches allows the modeler to select transmitters manufactured by Futaba, Hitec, Airtronics, Ace and JR, along with the correct FM deviation (high or low side). The connector block is conventional; this means that it's able to accept most popular servo connectors, including the new "Z type" from Airtronics. It is not marked on the case, so the polarity must be carefully noted. The signal pin is closest to the label side of the receiver, followed by the positive battery pin and then the negative pin. Excellent range and selectivity make this receiver suitable for any active R/C flying field. Primarily suitable for schoolyard or park-type outdoor fliers, it may also be used for indoor, slow-flying R/C models.

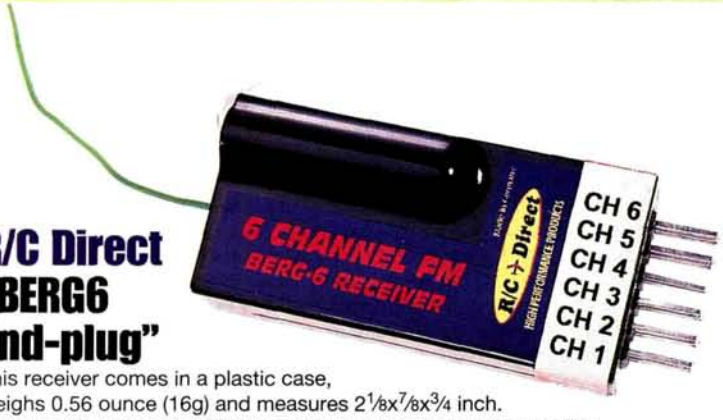
Hitec RCD "Micro 555"

This is the only receiver in the survey group that employs dual-conversion circuitry (two IF frequencies using two separate crystals). Expect full, narrowband performance and excellent radio range. It operates on FM and is available on all 72Mhz R/C channels, but not on 6 meters. It has a 5-channel control capability. Weight with its case is 0.78 ounce (22g); with the case removed, the weight drops to 0.64 ounce (18g—just slightly heavier than our guideline for inclusion in this survey). We included this receiver because it is known to be an excellent performer, and it is the smallest unit that still uses dual-conversion circuitry. Without its case, the Micro 555 measures 1½x1x½ inch. It is intended for Hitec servo connectors. Other connectors can be used, but the polarity must first be carefully checked.



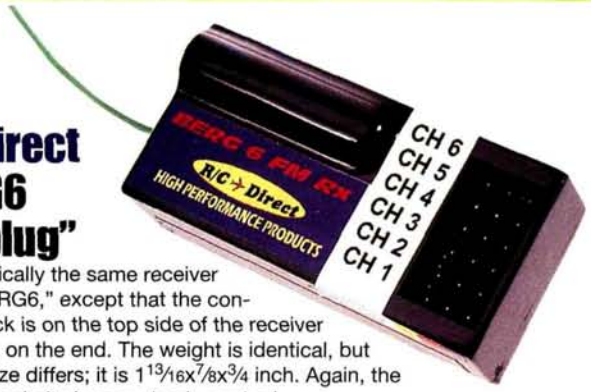


R/C RECEIVERS



R/C Direct "BERG6 End-plug"

This receiver comes in a plastic case, weighs 0.56 ounce (16g) and measures $2^{1}/_{8}x^{7}/_{8}x^{3}/_{4}$ inch. It is a single conversion FM type with 6-channel control capability available on both 72MHz and 50MHz (6m band; $20 higher price). To further save weight, the receiver may be removed from its case. A length of heat-shrink tubing is provided to cover the receiver once it has been removed from the case. FM R/C transmitters that have both high-side (JR and Airtronics) and low-side (Futaba, Hitec and Ace) deviations can be used. The modeler can select deviations with a little soldering. Connectors are conventional and are located at the end of the case. They are very clearly marked "SIG," "POS" and "NEG." The manufacturer claims 5KHz selectivity, so this receiver should be able to work in any R/C flying-field environment.



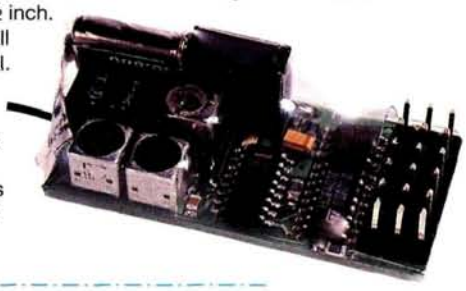
R/C Direct "BERG6 Top-plug"

This is basically the same receiver as the "BERG6," except that the connector block is on the top side of the receiver rather than on the end. The weight is identical, but the case size differs; it is $1^{13}/_{16}x^{7}/_{8}x^{3}/_{4}$ inch. Again, the connector polarity is very clearly marked.



R/C Direct "BERG6-Shrink-wrap

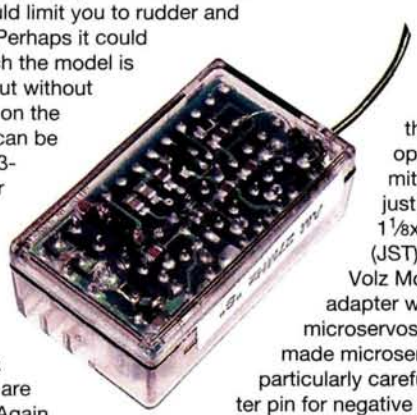
This receiver is identical to the Top-plug, except that it was removed from its case and covered with clear, heat-shrink tubing. With the case removed, the receiver weighs 0.42 ounce (12g). Its dimensions are $1^{3}/_{4}x^{3}/_{4}x^{1}/_{2}$ inch. Again, the electric parameters for all three BERG6 receivers are identical. The only consideration noted was that the connector-polarity sticker is on the case, so when the case is removed, the polarity marking is removed, too. Indoor R/C modelers will appreciate the light weight and slightly smaller size.





Hitec RCD "Shredder"

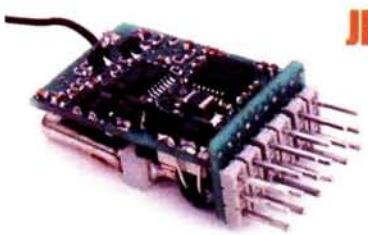
This AM receiver was originally conceived for R/C car and boat enthusiasts. As such, it has only two channel functions. For aircraft use, these would limit you to rudder and elevator, or rudder and throttle. Perhaps it could be used with CO_2 power, in which the model is flown with rudder and elevator but without any motor control. It is available on the 27MHz and 72MHz bands, and can be used with the Hitec Focus 2- or 3-channel AM transmitters or other AM transmitters. Weight is 0.49 ounce (14g), and the size is $1^{3}/_{8}x1^{3}/_{16}x^{9}/_{16}$ inch. This receiver has somewhat limited range and selectivity, although channel spacing on the six 27MHz R/C channels is a much wider 50KHz. Connectors are polarity-keyed for Hitec servos. Again, other connectors can be substituted, provided you check the polarity carefully.



CETO/Potensky-4

The CETO/Potensky is a 4-channel-function FM receiver that is offered on 72MHz R/C channels and can be operated by Graupner, Futaba and Hitec FM R/C transmitters, but will not work with JR and Airtronics. It weighs just 0.21 ounce (6g). Dimensions, including the case, are $1^{1}/_{8}x^{3}/_{4}x^{5}/_{8}$ inch. The connectors are the Joint-Safe-Tech (JST) micro types; this is the registered trademark of Volz Modellbau of Germany. As such, some type of adapter will be required to accept many of the popular microservos sold in the U.S. However, many European-made microservos do come with these JST connectors. Be particularly careful of the connector pin polarity. They use the center pin for negative battery polarity; most other receivers have battery positive as the center pin. The manufacturer claims 10KHz channel spacing is possible. My understanding is that this receiver is quite selective. Its range is approximately 1,000 feet.





JR R600M Ultra Micro Receiver

At press time, we learned of this new entry into the world of micro R/C. According to JR, its new FM micro receiver weighs 0.46 ounce (13g) with its case and 0.39 ounce (11g) without a case. Dimensions with case are $1^{1}/_{2}x^{13}/_{16}x^{5}/_{8}$ inch and dimensions are $1^{3}/_{8}x^{3}/_{4}x^{1}/_{2}$ inch without case. It will have 6-channel functions and be available on all 72MHz R/C frequencies. The single-conversion circuit is claimed to have out-of-sight radio range and excellent selectivity. This receiver has a new companion microservo: the JR-241 (available now). The receiver will be available in production quantities by the end of 1999.

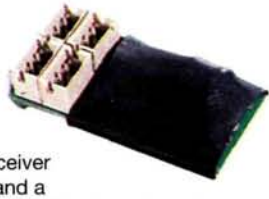
Sky Hooks & Rigging's SHR-RX72-F



This receiver is similar electronically to the SHR-RX72, except that it has conventional servo-connector pins along one end of the receiver. The weight is the same; still an incredible 0.07 ounce (2g), although the size is slightly different at 1 1/8x9/16x3/8 inch. This model receiver has 5-channel control capability. The connector polarity is not marked on the receiver, but the instructions are quite clear. The center pin is the more common battery positive.



Sky Hooks & Rigging's SHR-RX72



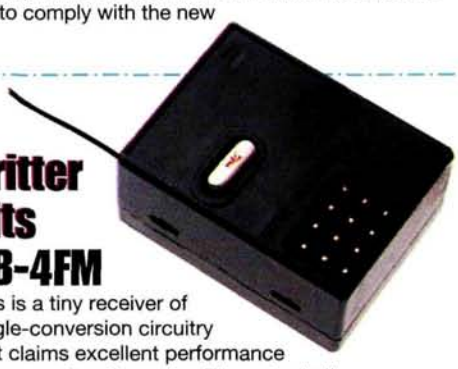
Now we are getting into the really small, almost "ultra" micro receivers. This one is manufactured by Tom McCann of Oakville, Ontario, Canada, and it weighs just 0.07 ounce (2g); that's 1/10 ounce! Its light weight matches its size: just 1x1/2x5/16 inch. This tiny receiver appears to be nothing more than four JST connectors and a postage-stamp-size circuit board. It is available on 72MHz R/C channels and operates on FM. This particular model has 4-channel control capability. It is compatible with JR, Airtronics, Multiplex, Hitec and Futaba R/C transmitters. The selectivity claim is ± 76KHz, and that makes it broadband—definitely not narrowband. So when flying, you will have to block out several frequency clips on either side of your operating channel. The claimed radio range is 1,000 feet, which is more than enough to fly both indoors and in schoolyards. Again, since JST connectors are employed, you had better check the polarity before you attempt to connect any servos. In a recent phone conversation, Tom mentioned that his receivers have been certified to comply with the new FCC regulations.

Cannon Ultra Micro Receiver

Over the years, Bill Cannon has been one of the pioneers of micro-size R/C systems. To aid indoor and parking-lot fliers, he continues to reduce the size of his equipment. Bill's Ultra Micro receiver (the only we are aware of that is made exclusively here, in the USA) weighs just 0.57 ounce (16g) and is enclosed in a plastic case measuring 1 1/4x1 1/16x9/16 inch. If you remove the case, the weight drops to 0.42 ounce (12g), and the dimensions are further reduced to 1 1/16x15/16x7/16 inch. The receiver is a full-performance type with excellent selectivity and range. It operates on AM and can be made available on all 27, 72 and 50Mhz R/C channels. You can order the unit with from two to five channel functions, and you may choose between Cannon proprietary micro connectors or the more conventional Deans connectors. Again, heed the caution about checking servo connector polarity before plugging in that microservo the first time. Be advised that since this is an AM receiver, your choices for a transmitter are somewhat limited to a Cannon, Hitec, or possibly an older Ace Micropro-8000 with an AM RF board.



Critter Bits CB-4FM



This is a tiny receiver of single-conversion circuitry that claims excellent performance at a very attractive price. The only challenge so far has been getting the Far East supplier to actually produce these units in sufficient quantities to meet the demand. The Critter Bits receiver comes in a plastic case that measures 1 1/16x7/8 x9/16 inch and weighs 0.28 ounce (8g). Removing the case could further reduce the weight and size. Connectors employed are conventional, but no instructions were provided concerning connector polarity. Four-channel control functions are provided. The receiver operates on FM from both Futaba and Hitec transmitters on 72Mhz frequencies. Selectivity is claimed to be very narrow at around 10KHz, and the stated range is on the order of 750 feet.

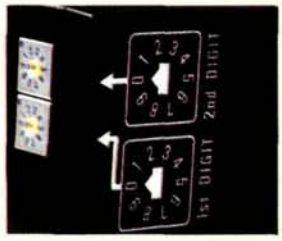
Hitec RCD Prism-7 Transmitter with Spectra Synthesized RF Module

The Hitec Spectra module allowed us to easily operate all of the FM micro R/C receivers that were provided to the magazine for this survey. It didn't matter which receiver channel was used because we only had to "tune" the transmitter to it.

The Spectra module is an interesting accessory that's designed specifically for use with the Hitec Prism transmitter. It replaces the more common, single-channel RF module with a multi-channel module. In the past, it was necessary to buy an individual—and expensive—module for each frequency you wish to operate on. With the Spectra module, you need only plug it in and dial any one of the 50 aircraft R/C channels. To preclude accidentally changing channels, the dials have been thoughtfully placed on the inside of the module. In other words, you must physically remove the module to access the two channel-changing dials.



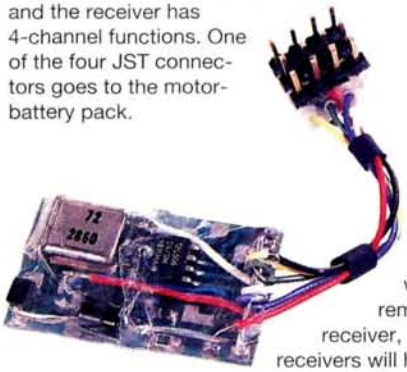
This combination of Hitec transmitter and tunable RF module would prove especially helpful for indoor, backyard or parking-lot fliers because non-interfering channels could more easily be selected. You would only need a few extra receiver crystals (check with your receiver manufacturer for cross-brand crystal compatibility). Think about it!



Sky Hooks & Rigging's RX72 H (Hybrid)



This is an SHR-RX72 micro receiver to which an integral 4A electric-motor speed control has been added. All of the features of the SHR-RX72 receiver are included. The speed control will allow from 6 to 10.5V input. The BEC provides 5 volts at 0.8 amps. A microprocessor will not permit engine startup unless at low throttle. It will also stop the motor on loss of radio signal. The Hybrid ESC does not shut off the motor when the voltage drops below 5.3 volts, but it does reduce the amount of full throttle available to a maximum of half throttle. Weight of this combined receiver and ESC is only 0.14 ounce (4g), and the dimensions are 1x3/4x5/16 inch. JST connectors are employed, and the receiver has 4-channel functions. One of the four JST connectors goes to the motor-battery pack.



Sky Hooks & Rigging's SHR-RX72-PRO



Again, a micro receiver similar to the SHR-RX72 model, but this time, without any connector block. The idea here is to let you save more weight by soldering your servo's lead wires directly to the receiver circuit board. They probably called it the "PRO" because they expect only pros to take on this soldering job. Five-channel control capability is possible with this receiver. My digital scale still read 0.07 ounce, or 2 grams, although I felt that it was lighter than the other two sample receivers. I believe I reached the minimum point of sensitivity on my scale. Dimensions of the "PRO" model micro receiver are 15/16x9/16x5/16 inch.

Garrett Receiver

This receiver has been available for more than a year now. It is the one I used in my AIKA electric indoor model in the September 1999 *Model Airplane News*. The Garrett weighs 0.07 ounce (2g), including a cable with four conventional connectors attached. If you remove this cable and solder the servos directly to the receiver, you can save a lot of extra weight. In the future, Garrett receivers will have the servo connectors mounted directly on the circuit board. The center pin is battery positive. Dimensions are 1 1/8x5/8x1/4 inch. The receiver is available on certain 72MHz FM and will operate from most popular FM R/C transmitters. Two capacitors and a diode are supplied with instructions, in case your motor causes noise to get into the receiver. I did not have this problem with my Garrett. The receiver is not very selective and will require that you take at least two frequency clips on either side of your operating frequency. Radio range on my receiver was only about 300 feet, but I have flown it outdoors at considerable range without a problem. My understanding is that the new production run of receivers will have considerably more range.

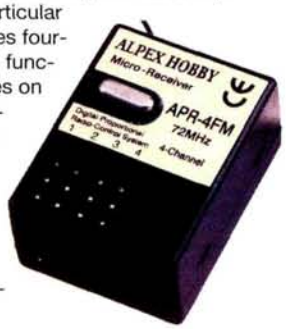
Sky Hooks & Rigging's SCSH-4A



This is the 4A electric-motor speed control that comes built into the SHR-RX72 Hybrid receiver. The ESC can be purchased and operated separately from the receiver. It weighs 0.07 ounce (2g) with wires but without connectors, and it measures 3/4x5/16x3/16 inch. All of the parameters mentioned with the Hybrid receiver apply here as well.

Balsa Products Model APR-4FM

This receiver's specifications are similar to those of the Critter Bits model. The price of the basic receiver is a little lower, but the crystals must be purchased separately. This particular receiver provides four-channel control functions. It operates on FM and is available on 10 R/C channels on the 72Mhz frequencies. You must specify the operating transmitters, either Futaba/Hitec or JR/Airtronics. Radio range is claimed to be around 1,500 feet.



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Just send "subscribe sfrc" in the body of the email message to:

sfrc-request@airage.com

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You will receive an email in response to your subscribe request. Just hit "reply," and send the message back to confirm that you have joined. To cancel, simply send an email with "unsubscribe sfrc" or "unsubscribe sfrc digest" in the body of the text to the same email address. The subject or title field is not relevant. This listserve is for the sharing of knowledge among modelers interested in backyard flying and is not an advertising forum. If you are curious about this new segment of our hobby, here's one place to stay on the leading edge. Give it a try!

MICRO R/C RECEIVERS

Name	Size (in.)	Weight (oz./g)	FM	AM	No. of channels	27mHz	50mHz	72mHz	Range (ft.)	Price with crystal*/ Price without crystal
Balsa Products Engrg. APR-4FM	1 1/16x 7/8x 9/16	0.28/8	Y	N	4	N	N	Y	1,500	$29.95/$24.00
Cannon Ultra Micro Receiver[2]	1 1/4x1 1/16x 9/16	0.57/16	N	Y	2 to 5	Y	Y	Y	bv	$93.93-$104.95/NA
Cannon Ultra Micro Receiver[3]	1 1/16x 15/16x 7/16	0.42/12								
CETO/Potensky-4	1 1/8x 3/4x 5/8	0.21/6	Y	N	4	N	N	Y	1,000	$89.95/NA
Critter Bits CB-4FM	1 1/16x 7/8x 9/16	0.28/8	Y	N	4	N	N	Y	750	$29.95/NA
FMA Direct "Tetra"	2 1/8x 3/4x 1/2	0.5/14	Y	Y	6	N	Y	Y	bv	$72.90/$59.95
Garrett Receiver	1 1/8x 5/8x 1/4	0.07/2	Y	N	4	N	N	Y	300-400	$89.95/NA
Hitec RCD "Micro-555"[2]	1 9/16x1 1/16x 1 1/16	0.78/22	Y	N	5	N	N	Y	bv	$75.00/$65.00
Hitec RCD "Micro-555"[3]	1 1/2x1x 1/2	0.64/18								
Hitec RCD "Shredder"	1 3/8x 13/16x 9/16	0.49/14	N	Y	2	Y	N	Y	500-1,000	$45.00/$35.00
JR R600M Ultra Micro Receiver[2]	1 1/2x 13/16x 3/5	0.46/13	Y	N	6	N	N	Y	bv	NA/NA
JR R600M Ultra Micro Receiver[3]	1 3/8x 3/4x 1/2	0.39/11								
R/C Direct BERG6 end-plug	2 1/8x 7/8x 3/4	0.56/16	Y	N	6	N	Y	Y	bv	$64.95/$54.95
R/C Direct BERG6 top-plug	1 13/16x 7/8x 3/4	0.56/16	Y	N	6	N	Y	Y	bv	$64.95/$54.95
R/C Direct BERG6 shrink-wrap	1 3/4x 3/4x 1/2	0.42/12	Y	N	6	N	Y	Y	bv	$64.95/$54.95
SH&R[1] "SHR-RX72"	1x 1/2x 5/16	0.07/2	Y	N	4	N	N	Y	1,000	$98.00/NA
SH&R[1] "SHR-RX72-F"	1 1/8x 9/16x 3/8	0.07/2	Y	N	5	N	N	Y	1,000	$104.00/NA
SH&R[1] "SHR-RX72-PRO"	15/16x 9/16x 5/16	0.07/2	Y	N	5	N	N	Y	1,000	$104.00/NA
SH&R[1] "RX72 H"	1x 3/4x 5/16	0.14/4	Y	N	4	N	N	Y	1,000	$124.00/NA

*Estimated street prices are subject to change.

[1] SH&R=Sky Hooks & Rigging, [2] With case [3] Without case

Key to abbreviations: bv: beyond visual; NA: not available at press time.

MICRO R/C RECEIVER SOURCE GUIDE

Balsa Products
Model APR-4FM
122 Jansen Ave.
Iselin, NJ 08830
(732) 634-6131
dperu@home.com
www.balsapr.com

Cannon R/C Systems
Bill Cannon
2756 N. Green Valley Pky., Ste. 405
Henderson, NV 89014
(702) 896-7203
(Cannon Ultra Micro receiver)

Cloud Nine R/C
John Worth
4326 Andes Dr.
Fairfax, VA 22030
Phone/fax: (703) 273-0607
Please call between 10 am and 2 pm, Mon. - Fri.
(CETO/Potensky, Garrett, SH & R)

Critter Bits
CB-4FM
Karlton Spindle
(818) 785-2401
CB4@multiplexrc.com
www.Tecnago.com/cb4.htm

David Lewis
4027 Rocky River 26
Cleveland, OH
44135-1147
(216) 251-2517
dlewis@usginteriors.com
(CETO/Potensky, Garrett)

FMA Direct
Fred Marks
9607 Dr. Perry Rd., #109
Ijamsville, MD 21754
(301) 831-8985
Fax (301) 831-8987
sales@fmadirect.com
www.fmadirect.com
(Tetra receivers)

Garrett Micro Receiver
Paul Garrett
205 Memorial Dr.
Greenville, OH
45331-2023
(937) 548-9492

Hitec RCD Inc.
Glenn Merritt
12115 Paine St.
Poway, CA 92064
(858) 748-6948
Fax (858) 748-1767
www.hitecrcd.com
(Hitec Micro 555 receiver and the Shredder)

Hobby Club Inc.
931 Calle Negocio, Ste. F
San Clemente, CA 92673
(949) 240-4626
(CETO/Potensky receiver)

Horizon Hobby Distributors Inc.
4105 Fieldstone Rd.
Champaign, IL 61822
(217) 355-9511
Fax (217) 352-2010
www.horizonhobby.com
(JR Micro Receiver)

RC Direct
7750 Convoy Ct.
San Diego, CA 92111
(619) 277-4531
Fax (619) 560-9695
(Berg receivers)

Sky Hooks & Riggings
Tom Mc Cann
2206 Towne Blvd.
Oakville, Ontario, Canada
L6H 5H4
(905) 257-2101
Fax (905) 257-0168
mi@media-interactive.com
www.indoorrc.com
(SHR receivers, CETO/Potensky, Garrett)

Todd's Models
Todd Long
6506 149th Ave. NE
Redmond, WA 98052
(425) 562-3169, (425) 503-4617, Fax (425) 883-3550
rcpilot@flash.net
www.flash.net/~rcpilot

SKY HOOKS DISTRIBUTORS NOT LISTED ABOVE:

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Derek Nunnally
1340 Mount Vernon Rd., NW
Monroe, GA 30656-4928
(770) 267-0064

Keith's Hobby Shop, Ltd.
Brian Alsop
5205 Yonge St.
Willowdale, Ontario,
Canada M2N 5P7
(416) 222-4721
info@keithshobbyshop.com

Miniature Speedways, Inc.
T&T R/C Cars
Joe Sullivan
3420 Ave. K., Ste. 154
Plano, TX 75074
(972) 633-2470

Sunthesis Unltd.
Scott Cover
304 N. Wayne Ave.
Fullerton, CA 92833
(714) 525-2885

Wade's R/C Service
Wade S. Saltzgiver
30 B Research Dr.
Hampton, VA 23666
(757) 766-7300
wadesrc@norfolk.infi.net

MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

KYOSHO SUPER STEARMAN 40

by Chris Chianelli



THE FACT THAT ARFs will remain a permanent part of our hobby in the foreseeable future is, I think most would agree, a foregone conclusion. Like it or not—and I happen to like it—ARFs are here to stay. When I entered this hobby in the early '70s, ARF technology was at a stage in its development that was characterized by fuselages of vacuum-formed, ABS plastic skins over wooden crutches and wings of molded foam covered with soft vinyl. With these early ARFs, the "R" part of the acronym was, at best, dubious; "a bit of a stretch," so to speak. It wasn't that the building procedure had a lot more steps than today's ARFs, but those of us who were used to working with balsa and plywood found that the techniques needed to work with hard, plastic, vacuum-formed components were perplexing.

The next big milestone in ARF technology came in the mid-'80s. This period of development has been referred to as the "EZ-era." The EZ technology was pioneered by a Japanese company called Sports Aviation. EZ kits featured a thin, triple-layer, plastic/Mylar skin stretched over formers and ribs. These kits looked great, were light, flew very well (for the most part) and were far easier to assemble than previous ARFs. EZs were quite popular and were copied by other companies. But anything more than minor crash damage was very difficult—if not impossible—to repair.



ARFs—the next generation



SPECIFICATIONS

Model name: Super Stearman

Manufacturer: Kyosho

Distributor: Great Planes Model Dist.

Type: ARF scale biplane

Length: 39 in.

Wingspan: 49.4 in.

Wing area: 717 sq. in.

Weight: 5.75 lb.

Wing loading: 18.4 oz./sq. ft.

Engine req'd: .40 to .46 2-stroke or .52 to .56 4-stroke

Engine used: O.S. FS .52 4-stroke

Props used: 11x7 Master Airscrew/12x6 Zinger

Radio req'd: 4-channel w/five servos (aileron, rudder, elevator, throttle)

Radio used: Hitec Flash 5 System X

Fuel used: Wildcat* 4-stroke

Street price: $239.95

Features: built-up, all-wood ARF covered with iron-on film; built-up tail surfaces; fully stringered fuselage, D-tube wing with capstrips, painted fiberglass cowl, painted ABS wheel pants and tempered landing gear. Tank, wheels and steerable tailwheel assembly included.

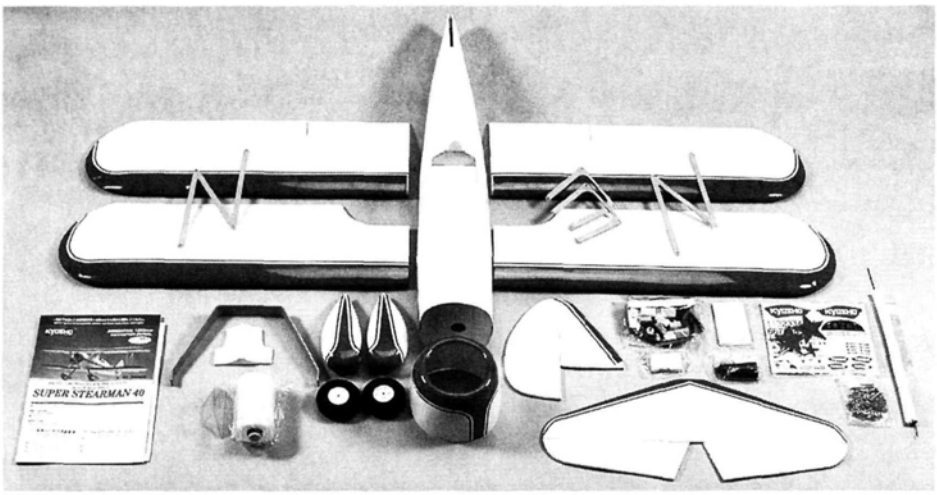
Comments: an impeccably executed, colorful scale biplane; its light wing loading makes it fly like a barnstormer's dream.

Hits

- Superbly built and finished ARF.
- Excellent parts fit.
- Good scale appearance.
- Excellent materials used.
- Extremely enjoyable to fly.

Misses

- Cabane and interplane strut nuts and bolts need to be replaced with locking aircraft nuts.



The contents of the box. Note: the fiberglass cowl and the ABS wheel pants are prepainted. Even the firewall is coated with epoxy.

Somewhere along this "ARF" timeline, all-wood types were being developed and were growing steadily more popular all the while. I always liked all-wood ARFs because they were built from a material with which I was very familiar. Liking them as I did, I knew I could end up with a better built, lighter weight model if I built it myself; that is, until I opened the box containing Kyosho's* Super Quality Series Super Stearman. After closely inspecting the fuselage, wing panels and tail group, I had to ask: could I have built this thing any better myself? My answer is an unabashed "I don't think so." And I do consider myself a good builder. I'd better at least be "good," after all these years.

THE KIT

The Super Stearman is superbly crafted and, in my opinion, represents the end result of many years of all-wood ARF "evolution." And this 50-inch-wingspan biplane does have the bottom-line numbers to back up my bold contention; that is, a light wing loading of 18.47 ounces per square foot. That, you can't fake! Moreover, this lightness is accomplished while keeping the airframe rigid. The Super Stearman is far from flimsy and will stand up to rough landings as well as any other conventionally built, all-balsa-and-plywood model.

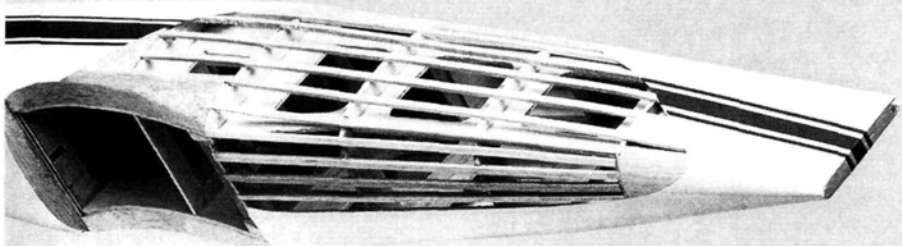
As you can see from some of the detail shots on these pages, Kyosho has gone to the limit with this model. From its fully stringered fuselage to its built-up tail group, the contents of the box oozed precision and quality. The balsa throughout is superb, and all structures are covered and detailed with an iron-on film that seems to be quite sag-resistant. Some examples of Kyosho's attention to detail include a fiberglass cowl (prepainted, of course), and a tempered-aluminum landing gear. The only thing I can find to criticize (I had to find something so you'd believe the great things I'm saying about this model) is the choice of screws and nuts for use in securing the cabane and interplane struts to the wings and fuse;

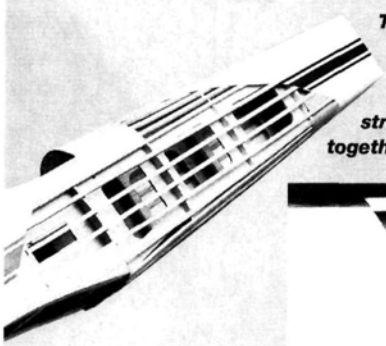


This pretty biplane called for a pretty pilot. Hobby Lobby's* Na (short for Naomi) is a perfect match. She comes colorfully painted (see opening page).

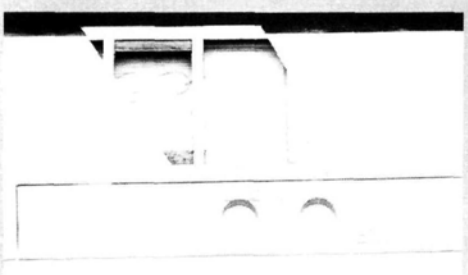
MORE THAN SKIN DEEP

A picture is worth a thousand words. Here, I've removed sections of covering from the fuselage and wing so you can see what a few extra bucks will get you. This model is built as well as it would be if you did it yourself; in some cases, maybe better! The airframe is light, true and rigid. The quality of wood used is very good throughout. The end result of Kyosho's efforts is a great flying model.

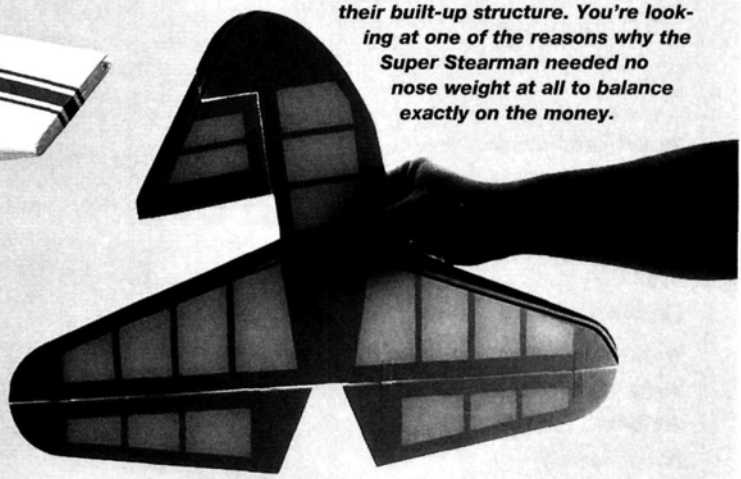




The outer stringer cage forms that scale Stearman fuselage shape. Strength is derived from an inner fuse crutch visible through the stringers. Tying these two structures together results in one rigid unit.

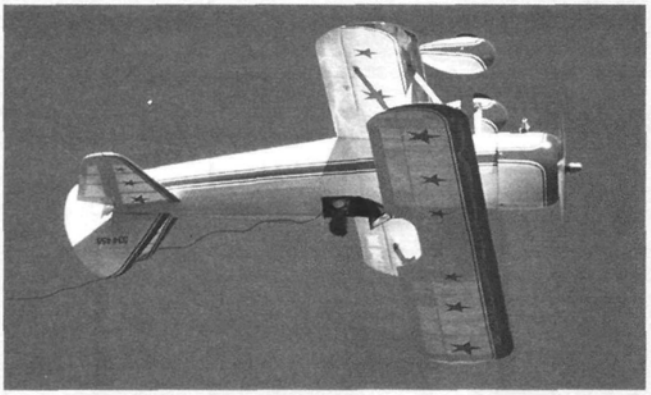


Revealed here are aileron lightening holes that extend along the entire length of the aileron. The string in the aileron servo bay is used to pull the aileron wires through to the wing center.



Here, our resident photographer, Walter, has back-lit the tail feathers to show their built-up structure. You're looking at one of the reasons why the Super Stearman needed no nose weight at all to balance exactly on the money.

FLIGHT PERFORMANCE



First flights always cause a bit of anxiety. A first flight with a medium-size, fast-reacting, aerobatic biplane is reason to be *more* than "a bit" anxious. I was, however, uncharacteristically serene when it came to the Super Stearman's maiden flight. It must have been that light wing-loading number floating around in the back of my head. Also, considering the way Kyosho went all out on the quality of this model, it would naturally follow that equal time was spent on developing its aerodynamics.

• TAXI AND TAKEOFF

As it turned out, the Stearman did not betray my confidence. After a few practice taxi runs on the grass field, which the Stearman handled very well both up- and downwind, wheel pants notwithstanding, it was time to—as the saying goes—"let 'er rip." As I opened the throttle and neutralized the elevator to allow the tail to rise, I readied myself for the anticipated application of right rudder. To my surprise, very little was needed. Apparently, the amount of right thrust built into the firewall is just about on the money. The Stearman did a very pretty takeoff run up on the main gear and gently broke ground. On a shallow climb-out, a bit of left aileron and down-elevator trim were needed; that was about it. I immediately took the model upstairs to check out the stall characteristics, which turned out to be most forgiving. With about ¼ throttle and full up-elevator, the model simply "mushed" forward and dropped its nose. This kind of behavior I did not expect from an aerobatic bipe.

• AEROBATICS

Experiencing its very forgiving nature, I began to wonder whether the Stearman was going to have problems performing stall maneuvers. It did not. Provided there's enough throw in the control surfaces, especially the rudder (all throws are recommended in the instructions), the Stearman spins easily and snaps on command. Recovery from a spin takes place, in most cases, in about ¼ to ½ revolution. With its light wing loading and responsive controls, the Super Stearman's forte is close-in and low, freestyle barnstorming—my favorite type of flying. Loops, rolls, knife-edge, Cuban-8s and avalanches are all at your fingertips. Initially, I did have to make one adjustment for inverted flight. The model was quite stable while inverted; however, due to too much negative incidence on the top wing, the model tended to climb while upside-down, even with the elevator at neutral. I fixed this by adding one washer between the front of each strut and the upper wing, thereby reducing, but not eliminating, the upper wing's negative incidence. Remember, aerobatic bipes typically have a degree or so of negative incidence in the upper wing to compensate for their center of drag's being far from the thrust line.

• LANDING

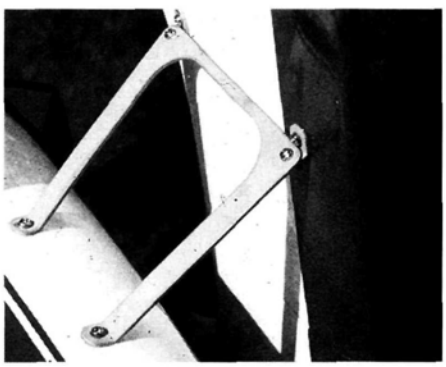
Because of its bright red-and-white scheme, the Stearman is quite easy to see on the down, base and final legs of a landing approach. The thing to keep in mind, as with most bipes, is the inherent drag of all those struts, two wings and that big, round cowl. Accordingly, to prevent the model from dropping out of the air due to lack of airspeed, keep a bit more throttle applied than is normal with a monoplane. When on final, control the speed with elevator and rate of descent with throttle, and this little bipe will set down slow and pretty every time.

they are 3mm Phillips-head screws and plain nuts. Now, I don't care how well you balance your prop; plain screws and nuts holding metal struts to metal stay brackets are going to vibrate loose. End of story. I recommend you replace these screws and nuts with Allen capscrews and locking aircraft nuts. They will not only stay put, but it's also a lot easier to install 12 sets of tiny screws and nuts with an Allen ball driver than with a Phillips-head screwdriver. Believe me; I've been there, and I have a screwdriver hole in the bottom wing covering to prove it! Other than these particular screws and nuts, the rest of the hardware that comes with the kit is of very good quality, and I used it all (tank, wheels, pushrods, clevises, steerable tailwheel, etc.) when I assembled the Stearman. If I don't like kit-included hardware, I'll replace it in a real hurry with something I know and trust.

ASSEMBLY

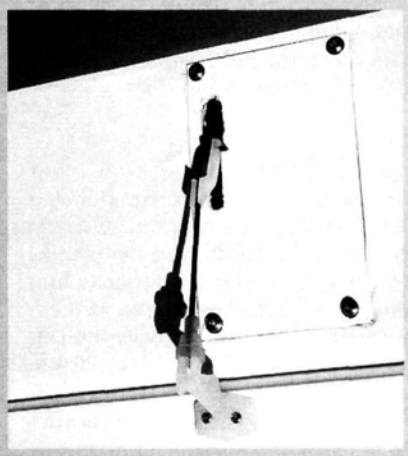
The best way I can characterize the assembly of the Stearman is that it fits together like a precision puzzle. In this case, though, Kyosho gives you a 16-page instruction manual with more than 100 pictures and diagrams to tell you exactly where each part of the puzzle goes. There's no guesswork involved. The best illustration of the nearly perfect fit found throughout the building process is demonstrated in the cabane and interplane strut fit. To start, the holes for the 12 strut-anchoring "L" brackets are predrilled and placed perfectly on the wings and fuselage. The various obtuse and acute angles needed in the "L" brackets and cabane struts are prebent exactly. To make a long story short, when it was time to bolt the wings to the fuse, all the holes in both the cabane and interplane struts lined up perfectly with the holes in their corresponding "L" brackets. Not even the slightest bending or other "coercion" of any kind was needed to get everything to line up and bolt together. This level of precision fit makes building such a pleasure. I think the only time I used expletives during the entire building process was when I dropped tiny screws onto my messy shop floor or watched spilled CA glue eat its way though the Robart foam fuselage cradle I use during construction. Assembling this model was pure joy for me.

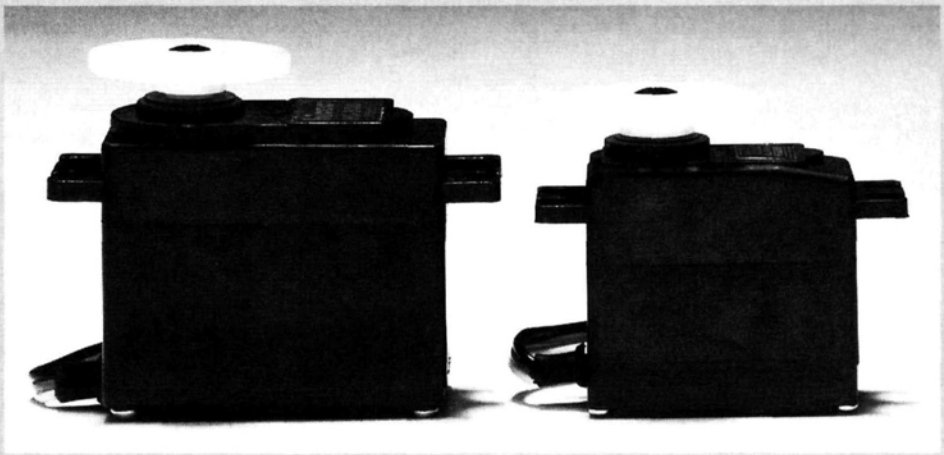
Some of the Japanese-to-English translations in the 16-page manual are a bit cryptic, so Great Planes supplies a 4-page text supplement that clearly describes each of the 32 steps in well-written



All angles are prebent in the cabane strut hardware, and they fit perfectly. Pilot holes for the self-tapping screws are also predrilled in the wings and fuse.

THE MIGHTY MINI





Although the aileron servo bay can accept a standard-size servo, the fit is a bit tight. Accordingly, I used Hitec's HS-225 Mighty Mini. Shown actual size are a standard-size HS-300/S-148-type servo on the left and the HS-225 on the right. The size difference is obvious and, at 55 oz.-in., the 225 is considerably more powerful than most standard servos.

English. I'm not going to waste your time or our space boring you with a step-by-step account of assembly, since the instruction booklet does such a great job. There are, however, two things I did differently. Great Planes* states that standard-size servos are fine for the Stearman, and they are. Because of the round, scale fuselage, there is plenty of room in the radio compartment. But I used smaller servos for the aileron servos that are mounted in the bottom wing panels. While standard, 148-type servos will fit inside, mine were pressed tightly against the upper wing sheeting, and a slight crease was visible on the outside of the upper wing sheeting where it was contacting the servo's corner edge. Accordingly, I opted to use Hitec's* awesome Mighty Mini HS-225BB servo. Though this servo is considerably smaller than standard size, it puts out an impressive 55 oz.-in. of torque at 4.8 volts, compared with Hitec's standard HS-300, which puts out 42 oz.-in. This little servo is also quite fast, and that comes in handy on a responsive, aerobatic little bipe such as this one. Again, this servo option isn't absolutely necessary, but the little HS-225 fit with room to spare, as opposed to the tight squeeze needed for a standard-size servo.

I also departed from the instructions by omitting the ABS fairings that go at the landing-gear/fuselage juncture. I didn't feel these vacuum-formed parts cut it in the looks department; Kyosho apparently agreed because the fairings were also absent from the plane pictured on the box!

POWER

At 5.75 pounds and with 716 square inches of wing area, any .40 2-stroke will provide plenty of power for this design. In my opinion, however, the perfect powerplant for this model is the O.S.* FS .52 4-stroke. Not only will it swing a larger, more scale-like prop, such as an 11x7 or 12x6, but the Stearman also balanced exactly on the money with this engine. I hate adding nose weight, and none was needed. More times than not, short-coupled biplanes need nose weight to balance correctly. This was yet another pleasant surprise that the Super Stearman sprang on me, and it's one of the factors that adds up to the 5.75-pound flying weight and light wing loading.

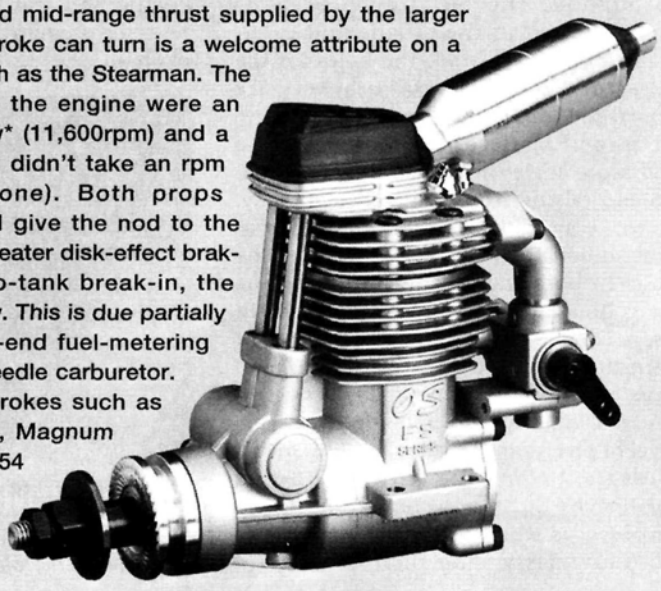
CONCLUSION

Although Kyosho's Super Quality Series ARFs cost roughly about $20 to $30 more than other ARFs of equal size, the high quality, precision fit, great scale appearance and, above all, super aerobatic performance, combined with gentle, slow-speed characteristics (for a fast-reacting bipe, mind you), make this kit more than worth the few extra bucks. I really don't know what else to say about this model except: go get one!

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.* ✦

THE PERFECT MATCH

The O.S. FS .52 4-stroke is a perfect match for the Stearman. The greater low-speed and mid-range thrust supplied by the larger prop sizes that a 4-stroke can turn is a welcome attribute on a high-drag biplane such as the Stearman. The two props I used on the engine were an 11x7 Master Airscrew* (11,600rpm) and a Zinger* 12x6 (sorry, I didn't take an rpm reading with this one). Both props performed well, but I give the nod to the 12x6 because of its greater disk-effect braking. After only a two-tank break-in, the engine idled flawlessly. This is due partially to the excellent, low-end fuel-metering qualities of the two-needle carburetor. Of course, other 4-strokes such as a Saito .56, Enya .53, Magnum .54, or Thunder Tiger .54 would also be a good match for the Stearman.





Right: Greg Hahn's beautiful, Ziroli-designed Panther is powered by a Dynamax fan and an O.S.* .91 fan engine. This all-balsa airplane has a generous, 76-inch wingspan (Steve Remington grabbed the great photo).*



Below: a good example of where it once was! Felipe Vidal and Frank Tiano sit still for a moment with Felipe's Byron MIG-15—a true blast from the past, it's no longer available, but it was one of the finest ducted-fan trainers you could hope for.



Without a doubt, one of the hottest, newest and fastest-growing segments of aeromodeling today is jet aircraft. Over the past two decades, the interest in jets has been on a steady rise and right now is attracting new pilots by the payload. Just attend a couple of jet fly-ins and you'll see what I mean!



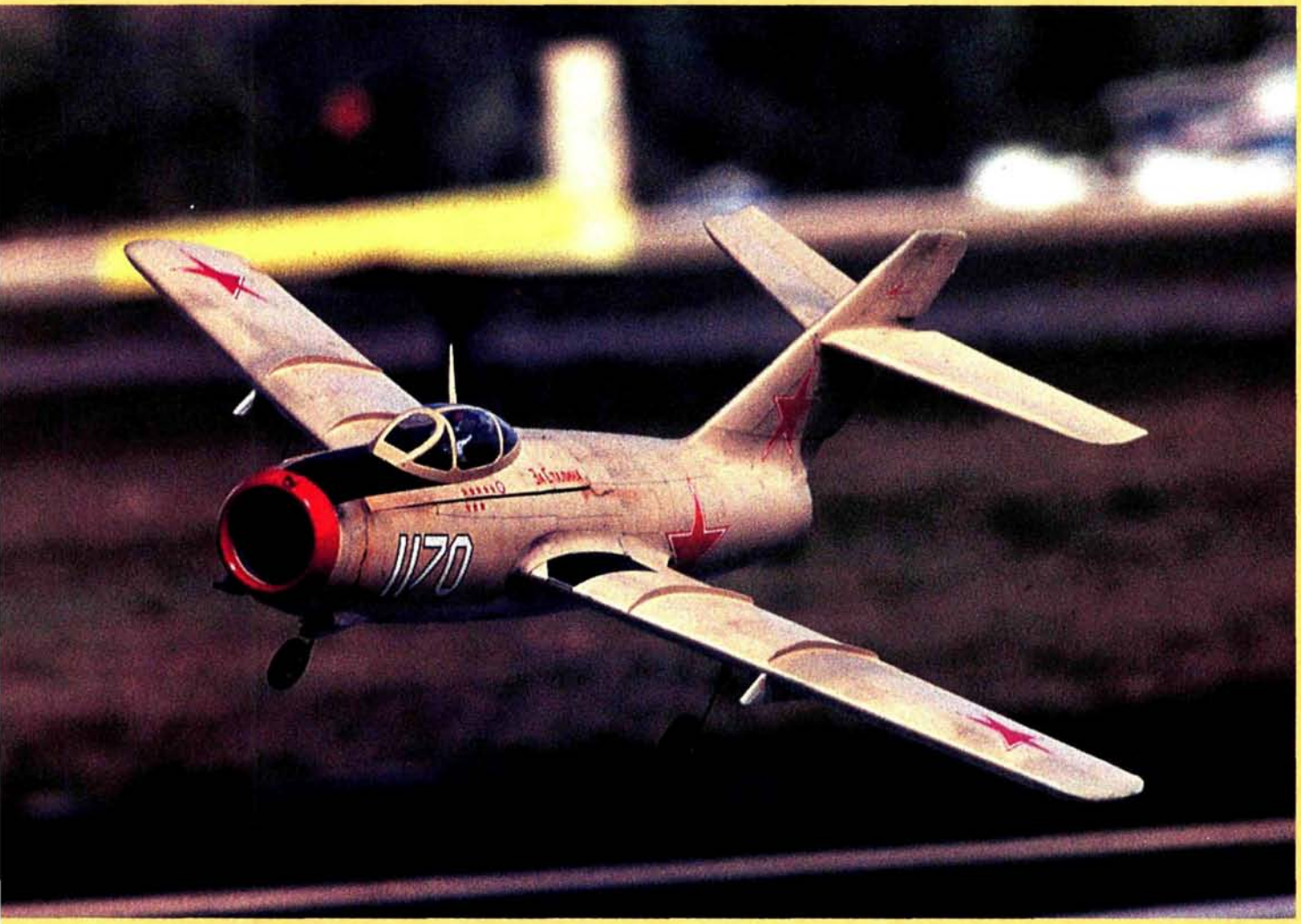
Above: for reference purposes only! Daphne Brogdon and Amber Benson attended the Best in the West jet fly-in with their honeys but found time to pose with a BVM ducted-fan-powered Bandit. This is not your father's model airplane! Jet modeling had a real boost from a 5-minute segment on a St. George, UT, TV show called "Cool Tech."

IN THE BEGINNING

The ducted-fan jet was pioneered in the mid-'70s by the team of Bob Violett and Jim Scozzafava. Working together, they introduced the first no-kidding, ducted-fan unit—the Scozzi—using John Brodbeck's screaming little K&B 40 Formula One pylon-racing motor and a lightweight A-4 Skyhawk designed by Bob.

The Scozzi-powered A-4 awed modelers wherever it was demonstrated. Bob Violett spent many years developing that first ducted fan: increasing this, decreasing that, finding which materials would last and, finally, talking K&B* into making a true fan engine—one that had a rear exhaust and gobs more power. Once Bob had a powerplant, he started to design new models to house this powerful new ducted-fan system.

THE JET





What it has come to! A BVM Rafale sits on the tarmac. It just doesn't get any more high tech than this! This is a huge, all-composite, airplane with custom landing gear and 10 servos. It weighs in at 35 pounds, but it flies like a 4-channel sport ship with retracts. Sophistication is not cheap. This marvel will set you back $15,000!

EPIC

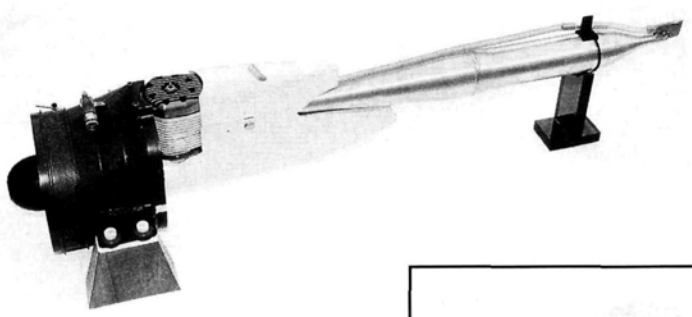
by Frank Tiano

And the blast goes on

Anyone messing with a ducted fan 25 years ago had his hands full. Mind you, the aircraft designs were as solid as a rock, but those screaming engines with their special tuned pipes and fuel systems had to be working in perfect unison for success.

By 1980, or so, problems had been sufficiently worked out to ensure that with just a little extra care taken in the preparation of the model, ducted-fan success could be expected.

Once the fan unit had been more or less sorted out, fan-engine size grew from .40 to .46, and then Bob Violett jumped dramatically to a .72. While other budding companies introduced a series of hot .60 engines, the Violett engine further grew to .82, and in recent years, this has been followed by the famous .91 and, just recently,

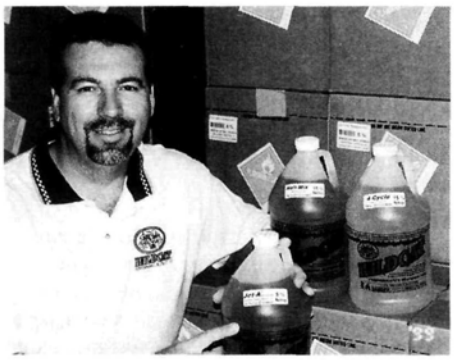


This is a powerful state-of-the-art ducted-fan system. You're looking at a BVM .96 and its tuned pipe and contoured aerodynamic faring mounted to a Viofan propulsion unit. This unit will fly aircraft in excess of 20 pounds.

the awesome .96. Almost all of the larger ducted-fan engines today are in the .90 to 1ci range.

By the early '80s, several other companies were manufacturing and developing ducted-fan airplane kits, engines and totally new fan designs. For the next 12 years or so, we saw all sorts of weird stuff such as two-stage fans, twin-cylinder engines, diesel-powered fans, mini fans, larger fans; you name it. It took a while for modelers to figure out which products worked best for them.

Even though ducted fans and jet models had progressed vigorously, there were still those who considered them a dubious

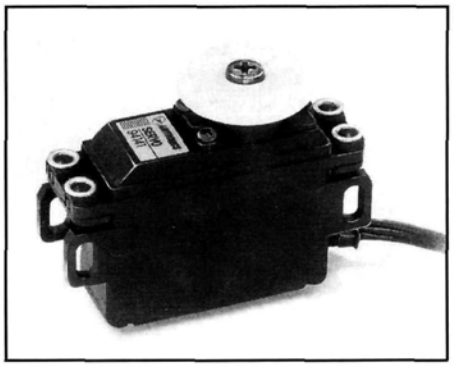


A high-performance, ducted-fan engine requires a premium-quality fuel. Simple sport fuels will not do the job and may actually cause bearing failure. Jerry Conley of Wildcat Fuel* produces the most popular jet fuel used. It's available in 5- to 15-percent nitro and all fuels contain a minimum of 22 percent oil.

power source. It took years of continued success to convince them that jets were a stable and fun alternative in our hobby.

After the smoke had cleared, even the most skeptical had to admit that jet subjects with ducted-fan propulsion units have become reliable models that have come into their own. As I said, just go to any jet event and see for yourself.

But enough of that; here's what else has happened during this time. Larry Wolfe, a model airplane designer and a fabulous pilot from California, bought the rights to the Scozzi fan unit, offered it under the name Turbax One and called his company Jet Hangar Hobbies*. Tom Cook had developed a competitive ducted-fan unit with an impeller of a slightly larger diameter; called the Dyna-Max, it uses the O.S. 91 fan engine for power. Byron Originals* entered the scene with some inexpensive, stand-off-scale models that used a pusher-type fan unit that worked well but in most cases required a huge cheater hole in the bottom of the airframe to work most efficiently.



Jets need high-quality servos, sometimes small enough to fit in a thinner wing. Airtronics* offers the 94141, metal-gear servo that has unique tabs that allow two mounting positions. These are perfect for the wing ailerons and flaps.

Bob Violett introduced a totally new ducted-fan unit—the Viojett. For a time, K&B supplied engines for this new fan. Later, Bob designed his own custom engine, which is the same today.

By 1995, we saw a turbine-powered model or two going through its teething stages. The model jet age had really arrived! Over the next few years, Tom Cook and Bob Violett introduced kits that could handle either ducted fans or turbine engines, and smaller companies soon followed suit. As far as the turbine engine manufacturers went, in the beginning, there were a bunch—everything from simple homebuilts to the sophisticated.

By 1998, only a few major players remained, and all are still with us. We'll cover the turbines in an upcoming segment.

THESE BULLS HAVE NO HORNS

In general, jet models are larger, and their engines—both turbine and ducted fan—are stronger than ever. This combination required that high-quality, specialized support gear be developed for these "upscale" airframes. Suddenly, we needed electronic throttle controls, better fuels, fuel pumps, stronger glow plugs, custom landing gear, metal-gear servos, tachometers, wheels, tires and brakes and a host of other gismos, doodads and accessories.

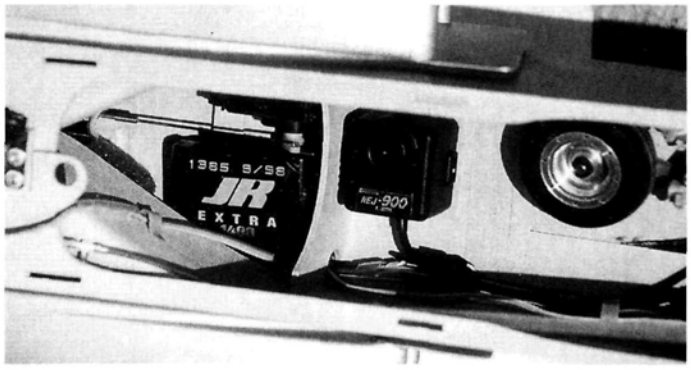
Someone had to take the bull by the horns and develop the necessary hardware. Remember, the original A-4 was a 5-channel airplane. That's four flight functions plus a channel for retract gear. As the models became larger, we added flaps and servo number six. Then we added mixture control to get more life out of the engine (that's channel seven) and speed brakes for the 20-plus-pound models (we're up to eight now).

See the great dilemma radio manufacturers were confronted with? They scrambled to produce radios with up to 10 channels, all of them proportional, and most with switch labeling capability and unlimited mixing. So when the latest twin-turbine engine Rafale taxis out to the end of the runway, you can bet your bottom dollar that it's loaded for bear, all 10 channels taken up with all the aforementioned, plus droppable stores and dive brakes! But wait, there's more.

OUT OF THIS WORLD

Some of the support equipment and accessories the jet modelers use are as interesting and as important as the models themselves. Ever hear of a company called Mini Hobby* (MH)? Tony Tahan, the owner, is a retired airline pilot who turned his creative talents towards the hobby.

MH offers a whole lot of stuff for all types of airplane models. First item is the MH Automix—a fantastic little box that's easily installed on any jet, boat, helicopter or prop aircraft. It has a small probe that measures exhaust-gas temperature and will adjust your fuel-mixture servo so that you will not run the engine too lean—just a great safety device.



Gyros are common in jet models. Eric Meyers uses a JR* 900 series gyro and a 6V, 1400mAh battery in his turbine-powered Bandit. Please notice how neatly all the wires have been laid into place.



What a device! The Mini Hobby APU II comes with its own charger and leads for the glow plug, 12V starter and air-filler valve connector. The handle ensures perfect balance, and this piece of equipment is all you need to take to the flight line.

MH also offers the MEC, or main engine controller—a device that processes turbine-engine information and uses that information to keep the turbine running within specs at all times. And then there's the MH Safe Lander: a delightful little gizmo that lowers your landing gear if it senses an air-pressure drop or low battery voltage. But my personal favorite item from their arsenal of jet equipment is the APU II—auxiliary power unit. An APU is a magical black box that no serious jet or scale modeler would ever be without. This compact unit houses a 12V battery and electronic wizardry to power your starter, light your glow plug, fill your air tank, fill your fuel tank and hold your ducted-fan starting wand as well. I've been using the original APU for three years now and consider it one of the most important tools in my inventory. The new version—APU II—is even better. It's probably the only thing jet pilots need to take to the flightline.

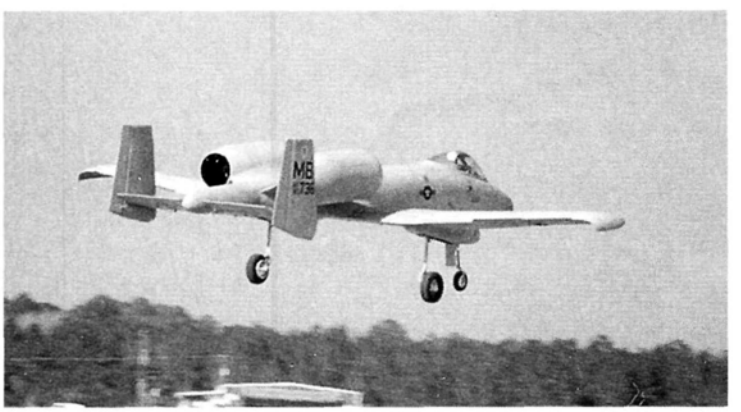


A very much younger Jim Scozzafava (left), and Bob Violett way back in the beginning with Bob's K&B/Scozzi-powered, Pro-Line guided, 8-pound, A-4 Skyhawk. The kit is still available today from Jet Hangar Hobbies and Yellow Aircraft.*

Another interesting product comes from Bob Violett Models* (BVM), and it's called the Smooth Stop. Remember, simple, crude braking systems have been around for years. The early designs featured a nylon line that pulled on a spring that expanded against the tire and slowed the aircraft. Crude, yes, but it worked—on 6-pound airplanes with 2-inch tires. You can imagine the development along the way, until at last, several companies offer metal wheels with a no-kidding brake drum machined in place. BVM took it the extra mile: the Smooth Stop is a truly proportional brake system that will work with competitive brand wheels. It's very compact, requires a tiny servo to operate and weighs just a bit over 2 ounces. Don't forget that this report is meant to inform you, not go into details about the various products available, so give BVM a shout and ask for the flyer on part no. 5667. Check out the jet advertising, and drop the manufacturers a note and ask for their catalogs. Some cost a couple of bucks—some, more—but they are all interesting and informative. You will be amazed to see what is out there!



Futaba offers a low-profile, wing-mounted servo; the 9102 has 75 ounces of torque and is only 0.87 inch thick. Smaller servos as powerful as this one can be used throughout a jet model with confidence.*



How far will they go? Dean Lasek's gigundo A-10 uses a pair of RAM 750 turbines for power. It's a big, impressive bird spanning over 100 inches, and test pilot Rei Gonzalez flew it around Florida Jets just like the full-scale machine.*

EXACTLY WHERE ARE WE?

I can't pretend to know every manufacturer of jet model airplane kits and accessories in the country, but I do know of a few that offer great products. As far as kits go, there are several available in fiberglass and composite materials, some are glass and foam, and others are built entirely of balsa or balsa and fiberglass. BVM offers an extensive line (maybe the largest) of scale and sport kits, all of which have proven themselves at events like Top Gun, Florida Jets and the Superman Jet Rally.

For the sport enthusiast, BVM offers the entry-level Maverick followed by the Aggressor and Viper pattern-type sport models—all for ducted-fan use. Then there's the larger Bandit, available in turbine and ducted-fan versions and as a fiberglass and composite kit and as one with a balsa, built-up, wing.

Moving over to scale models for ducted fans, BVM offers an F-86 Sabre, the F-16, the F-80, T-33, MiG-15 and F-4 Phantom. The MiG, T-33 and F-80 can be ordered in a turbine version as well. A retro kit was just introduced for the F-4 to allow turbine power, and the new twin-turbine-powered Rafale is just being shipped.

Yellow Aircraft* has a few jet kits, too, its signature sport model being the Starfire, which was designed by Tom Cook for ducted-fan operation but is easily modified for turbine use. The company also has scale kits of the A-4, F-4 and F-18; all are smaller models intended for single ducted-fan use.

Tom Cook originally designed the Starfire and kitted it for many years. His company, Jet Model Products* (JMP), produces an all-composite Lockheed T-33 that spans something like 85 inches. It is one of the nicest kits available today. JMP also sells the Dynamax fan system, tuned pipes, wheels and several other jet accessories.

Possibly one of the newest companies to introduce jet kits is CAI*. Owner Scotty Boldac has a fleet of sport jets intended for turbine power. His newest offering is the Raptor, which is a rather big model for larger turbine engines. According to Scotty, the company plans to release several scale kits in the very near future.

Century Jet* is probably known more for its line of scale landing gear than for anything else, but the fact is, it, too, offers a line of scale kits for both ducted-fan- and turbine-powered airplanes. We've seen its MiG perform well at various jet events, and its F-4 has been around for ages.

Continued on page 130

by Richard Loud

6TH ANNUAL MIDWEST Slope CHALLENGE

WHAT DO YOU think of when you think of slope racing? More important, *where* do you think of? California ... Oregon ... Washington ... anywhere along the West Coast, right? Well, the Lincoln Area Soaring Society (LASS) of Lincoln, NE, introduces a handful of newcomers every year to a gem of a sloping site right in the heart of Kansas.

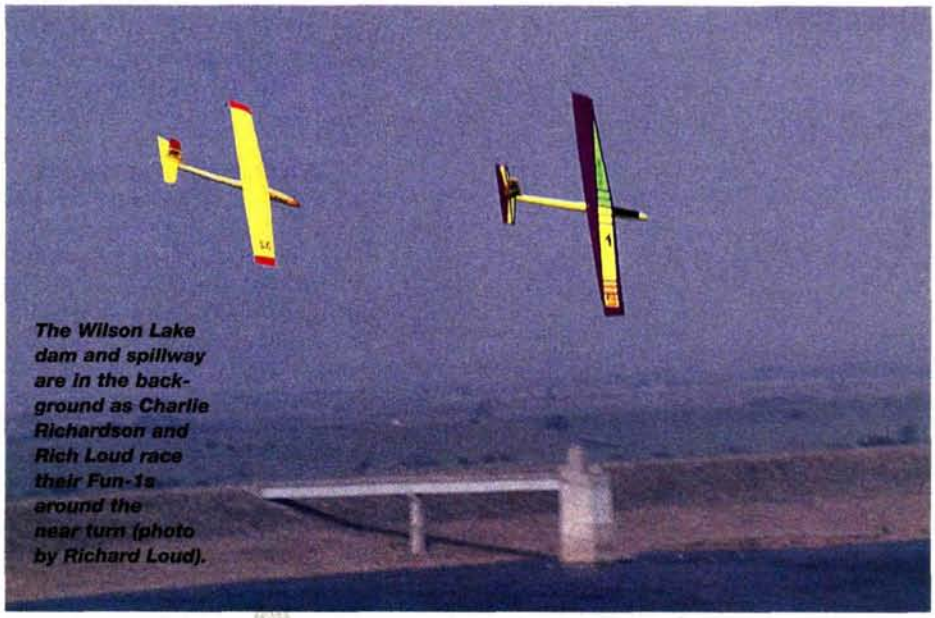
In the area around Wilson Lake in Russell County, hills and bluffs abound, and the wind blows almost all of the time. It is here that LASS holds its annual Midwest Slope Challenge.



With the call of "Launch 'em!" from race director Alden Shipp, Sig Ninjas are hurled into the air at the start of another round of the Ninja class race (photo by Richard Loud).

Ken Hawkins relaunches Todd Martin's DAW Me 163 after a wipeout at the pylon in foamie enduro racing (photo by Dave Garwood).

PYLON RACING WITH A SLANT



The Wilson Lake dam and spillway are in the background as Charlie Richardson and Rich Loud race their Fun-1s around the near turn (photo by Richard Loud).

PHOTOS BY RICHARD LOUD AND DAVE GARWOOD

Wilson Lake was created by the U.S. Army Corps of Engineers in the 1960s, mainly for flood control and water conservation. Because it's in an area with relatively few large lakes, it is also a center for recreation. There are five parks around its 100-mile shoreline, and of particular interest to out-of-town slope-heads may be the overnight camping facilities with free, hot showers. What better way to spend a weekend than camping at the base of one of the best slopes in the country?

Held on May 14 and 15 on the hills overlooking Wilson Lake, this year's event was the sixth in a series of very successful annual slope-racing meets. At its inception, the Midwest Slope Challenge was centered on two very popular models from Sig*: the Ninja and the Samurai. In recent years, it has grown to include unlimited-class racing and EPP foamie combat. This year, as a result of suggestions at last year's post-race banquet, we saw the addition of foamie racing and a 60-inch One Design race class (ODR).



FOAMIE FUN

Last year, the group voted to include more events for EPP foamies along with the typical combat event, so Friday was set aside for a sort of a foamie biathlon that combined combat with racing. The



Paul Naton (no. 4) makes a good turn and pulls ahead of Joe Chovan in this 60-inch race (photo by Richard Loud).



As Paul Naton and Ed Harris go head to head in a 60-inch race, start-gate judges track the laps and ensure that all turns are completed cleanly. Front to back: Alden Shipp of Quincy, IL, and Steve Rohman and Loren Blinde of Lincoln, NE (photo by Dave Garwood).



New York Slope Dog Joe Chovan (no. 50) gave veteran West Coast racer Paul Naton a run for his money in this 60-inch race (photo by Wayne Rigby).

combat portion was a typical mass-launch melee in which kills are scored by knocking other aircraft to the ground while maintaining control of your own. In each round, competitors had 5 minutes to score as many kills as possible.

The racing portion was a timed enduro event with 5 minutes to complete as many laps as possible around two pylons spaced about 20 yards apart. The difference here from typical slope racing is that the aircraft had to actually fly around each pylon, passing below its top. If you think about it, that means flight paths cross at a point along the course, and midairs are bound to happen. That's what foamies are for, right?

On this day, the wind was howling up to 30mph, which heightened the combat action and provided ample time for recovery after a hit. Consequently, very few kills were recorded. The wind also was a factor in the enduro, as many planes had difficulty penetrating the wind down at the level of the pylons and thus couldn't complete more than a few laps.

This was a combined event, so the scores for both the melee and the enduro were combined to determine the winners. Each enduro lap counted as one point, and each combat kill counted as five points. When the dust settled, Steve Dworsky was in fourth place with 15 points flying a Dave's Aircraft Works* (DAW) Me 163; Wayne Henning captured third place with 18 points, flying a Bowman* Roughneck; I came in second with 26 points, flying a DAW FoaME 109, and Paul Wright took home first place with 31 points flying a Trick R/C* Razor.

BATTLE OF THE NINJAS

We woke up on Saturday to cloudy skies and the threat of rain—leftovers from an overnight thunderstorm. But there was wind, and plenty of it. When we showed up at the slope at 9 a.m., racing planes were already in the air. Charlie Richardson of CR Performance Aircraft* in Vista, CA, and his factory pilot Paul Naton from Corvallis, OR, were already walking back to the pit area with their racers after beating most of the crowd to the site for some early-morning practice.

At 10 a.m., the LASS members had set up the racecourse, and Paul Wright, the event director, called the pilots' meeting with Alden Shipp as the race director for the day.

First up was the Sig Ninja class, in which planes were limited to a stock Ninja wing planform and a fuselage with a stock Ninja outline and shape. Other modifications were allowed, including ballast and rounded and strengthened fuselages; one entry even sported a V-tail. It's not a particularly fast flying bird, and the entry-level Ninja class was initially intended to bring more participants to events.

The Ninja was flown in heats of four set up in a matrix. After all heats had been completed, the four pilots with the most wins flew head to head to determine first through fourth places. The top four finishers were Jim Horton in fourth, Todd Martin in third and Wayne Henning in second. Linde Troiani pulled off first place in his first ever slope race.

Although not a particularly high-speed race, the Ninja class did offer a few dramatic moments. As Paul Wright said at the pilots' meeting, "The Ninja race is often won by attrition rather than speed; preserving your aircraft may be the key to finishing at the top." Yes, some midairs took a few planes out of the running, but the most memorable moment was Dave Garwood's race in the pits to repair his shattered fuselage with CA and strapping tape after an unexpected encounter with the hillside. It looked like a scene out of a war movie in which field medics race against the clock to save a dying soldier seriously wounded in battle. With the race director calling his name for his final round, cries of "Tape!" and "Knife! I need a knife!" filled the air as a crowd gathered in anticipation. As race director Alden Shipp shouted "Launch 'em!," Dave and his caller, Wayne Rigby, ran to the starting line still wiggling the sticks to make sure that the radio was turned on. No, Dave didn't win the race, nor did he make it to the finals, but it sure was a lot of fun to watch, and having fun was the number-one rule of the event.

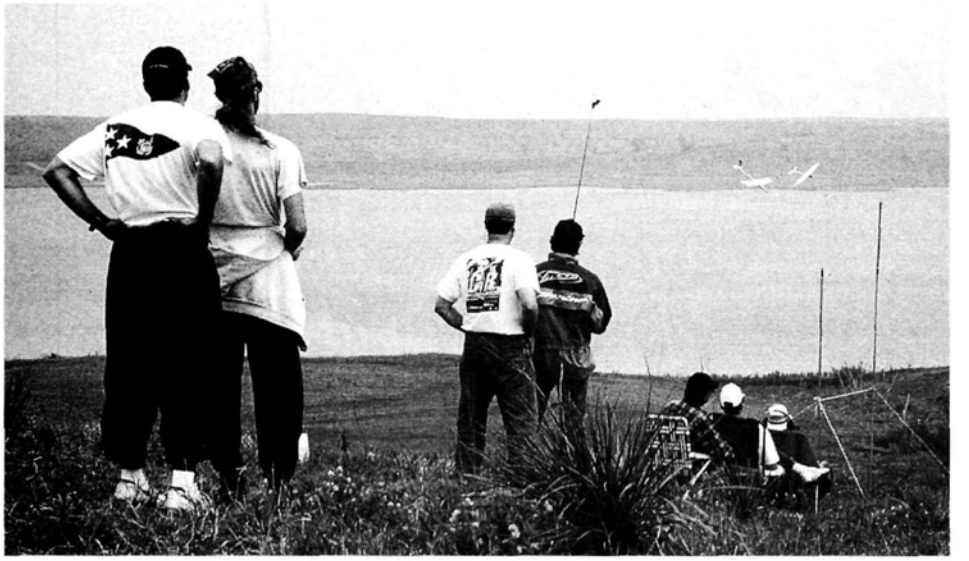
HIGH-SPEED ACTION

Next in line was the 60-inch class, limited to aircraft that met the ODR formula that originated with the Torrey Pines Gulls club in Southern California. Because only one kit manufacturer currently makes a design that meets the ODR formula, all entrants flew the CR Aircraft Fun-1.

This race was run in a double-elimination format that continued until all but one pilot had two losses. Unlike the Ninja class, in which four planes flew in each round, only two planes flew at a time. These models are capable of reaching some pretty high speeds, and limiting it to two models per round makes it safer for the planes, pilots, course workers and spectators. The wind began to vary in direction and strength during this event, so some races were contests of speed and smoothness while others were determined purely by who could stay in the air long enough to finish the race. The top spots for 60-inch were taken by Paul Wright in fourth, Joe Chovan in third, Paul Naton in second and Charlie Richardson in first.

With the help of Ken Hawkins and his caller, Wayne Rigby, Dave Garwood furiously rushes to repair the shattered fuselage of his Sig Ninja. Repairs were completed just as the race director yelled, "Launch 'em!" (photo by Richard Loud).





Neck and neck at the start. With the help of his caller, Todd Martin (left), Joe Chovan of Syracuse, NY, tries to beat veteran racer and Fun-1 designer Charlie Richardson of Vista, CA, to the starting gate. Charlie's caller is Paul Naton of Corvallis, OR—also a veteran slope racer (photo by Dave Garwood).

Because all the planes are alike, ODR is intended to level the playing field so the race will be won by the best pilot and not just the pilot with the fancier, more expensive airplane.

The final race of the day was the Unlimited event: anything-goes racing! We saw everything from high-speed rocket ships designed specifically for slope racing to an old Silent Squire. As long as it didn't exceed FAI weight and wing-loading limits, anything was game. The top finishers in Unlimited were Wayne Henning in fourth place, Charlie Richardson in third, Paul Wright in second and Paul Naton in first.

Race Results

FOAMIE RACING/COMBAT	
1 Paul Wright	Trick R/C Razor
2 Rich Loud	DAW FoaME 109
3 Wayne Henning	Bowman Roughneck
4 Steve Dworsky	DAW ME 163

NINJA	
1 Linde Troiani	Sig Ninja
2 Wayne Henning	Sig Ninja
3 Todd Martin	Sig Ninja
4 Jim Horton	Sig Ninja

60-INCH/ONE DESIGN	
1 Charlie Richardson	CR Aircraft Fun-1
2 Paul Naton	CR Aircraft Fun-1
3 Joe Chovan	CR Aircraft Fun-1
4 Paul Wright	CR Aircraft Fun-1

UNLIMITED	
1 Paul Naton	CR Aircraft Renegade
2 Paul Wright	Daryl Perkins Whip
3 Charlie Richardson	CR Aircraft Fun-1
4 Wayne Henning	Sig Samurai

SAME PLACE, NEXT YEAR

When the final tally was in, 70 rounds of racing had been completed in the two-day event. The fact that so many races could be pulled off without a hitch is a testament to the dedication and organization of the LASS crew and event director Paul Wright. We are looking forward to many more successful events in the future.

The next time you're looking for a little slope-soaring adventure, I hope you'll think about going to a lake in the heart of Kansas. You'll see cows, windmills and farms all around, but you'll also see some of the best soaring sites east of the Rockies. I hope to see you at the next Midwest Soaring Challenge.

For more information on LASS and the Midwest Slope Challenge, contact Paul Wright at 1745 140th, Garland, NE 68360-9322; (402) 796-2175. For more information on the Torrey Pines Gulls and One Design racing, check out their website at www.torreypinesgulls.org.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

MASTER AIRSCREW

Electric Accessories

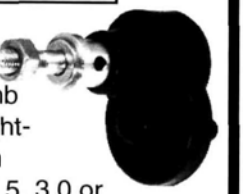
Electric Flight Pack

- Motor, gearbox, folding prop & motor mount combination!
- Available in 3 Ratios
- Great value at $41.95 sug. ret.



GearBoxes

- Longer flight times & greater climb
- Compact, lightweight design
- In 3 ratios: 2.5, 3.0 or 3.5:1
- $18.95 sug. retail



Folding Propellers



- Large blade area & less drag
- In sizes 12x8 and 15x12
- $8.95 - 9.95 sug. retail

Electric Wood Propellers



- Wide, very thin undercambered blades for great performance
- For electric flight only
- In 8 sizes from 10" - 13" dia.

Other Accessories

- Direct Drive prop adaptor $3.95
- 05, 7.2 volt motor, $15.95
- Aluminum motor mount, $4.59
- Folding prop replacement blades, $4.95

WINDSOR PROPELLER CO INC
3219 Monier Circle,
Rancho Cordova, CA 95742
www.masterairscrew.com

by Tom Atwood

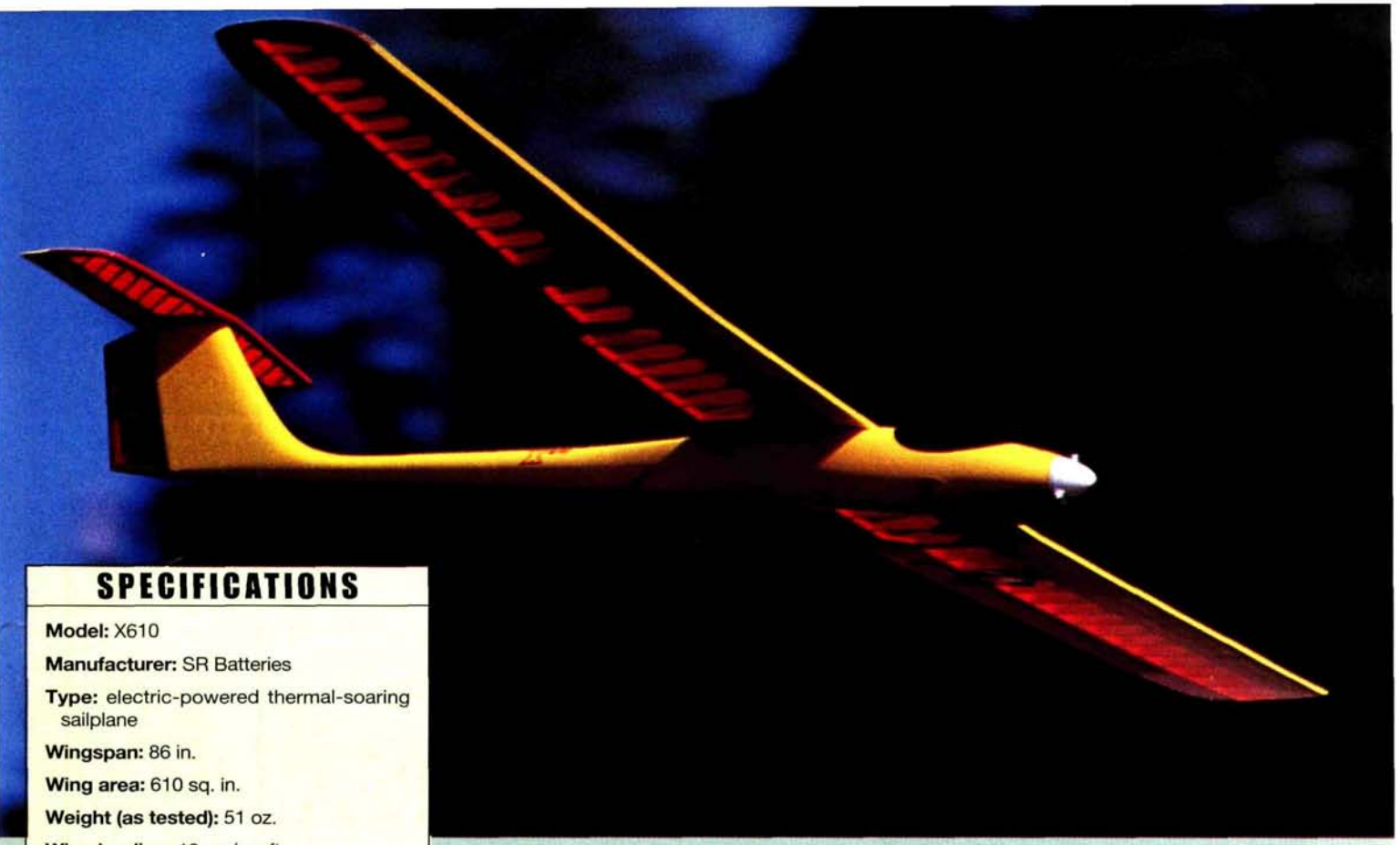
SR BATTERIES X610

Cutting-edge ARF electric thermal floater

There's nothing like flying a well-behaved, thermal-grabbing sailplane, especially one that is large enough to linger in a thermal with that stately grandeur that only the larger span ships seem to evince. Is it that their size makes them less sensitive to minor turbulence? Is it that the sweep of their wings is simply easier to see at altitude? Whatever that elusive quality of greatness in soaring flight may be, the X610, the subject of this review, captures it.

If you like open-bay sailplane designs that float across the sky, as do I, imagine the following. Marry precision manufacturing to an ARF design and give it an 86-inch wingspan, just over 7 feet. Make the wing out of high-quality balsa and ply, and cover it with transparent Ultracote Lite so that the airplane is both pretty and easy to repair should you ever accidentally ding the wing.

To eliminate forever the challenge of escaping from a "boomer" thermal that threatens to pull your soaring machine beyond visual range, equip the sailplane with ailerons that can double as lift-killing spoilerons. Give it a light fiberglass fuselage and preassembled, built-up tail feathers. Add to this SR Batteries'* endless quest to build customer



SPECIFICATIONS

Model: X610

Manufacturer: SR Batteries

Type: electric-powered thermal-soaring sailplane

Wingspan: 86 in.

Wing area: 610 sq. in.

Weight (as tested): 51 oz.

Wing loading: 12 oz./sq. ft.

Motor req'd: tested with SR Sport Power System—Graupner* Speed 500 Race motor; SR planetary 4.4:1 gearbox; 14x9.5 CAM* folding prop; Jeti* 350 ESC and 8-cell SR 1300 Max battery (other power systems available)

Radio req'd: 4-channel (throttle, ailerons, rudder and elevator), but programmable radio with spoileron, differential and aileron-rudder mixing preferred (Airtronics RD6000 used)

List price: $329.95 for the X610 alone; if purchased with the Sport Power System ($274.95), which includes a 7-cell pack, the price of the kit is reduced by $30.

Features: Completely prebuilt and covered, open-bay, 3-panel wing and prebuilt fin, rudder, horizontal stabilizer and elevator; epoxy/fiberglass fuselage; complete hardware package with horns for both standard and programmable radios.

Comments: a slow-flying thermaling floater that performs well. Spoileron functionality offers glide-path control in powerful thermals and better spot-landing control. Excellent manual. Allow yourself a week of evenings to carefully assemble this finely engineered airplane.

Hits

- Excellent workmanship.
- Excellent flight performance.
- Good instructions.

Misses

- Instructions for pulling aileron servo-lead extension wires into the servo bays were problematic to execute; see this review for an alternative, easier approach.

loyalty and their obsessively meticulous quality control. Finally, equip the plane with an affordable, geared, sport power system that provides an aggressive climb-out using a 14X9.5 CAM prop. Using 8, SR 1300 Max cells, the plane has a wing loading of only 12 ounces per square foot and easily climbs to thermal-catching heights three times on a charge. Does this sound like a winner?

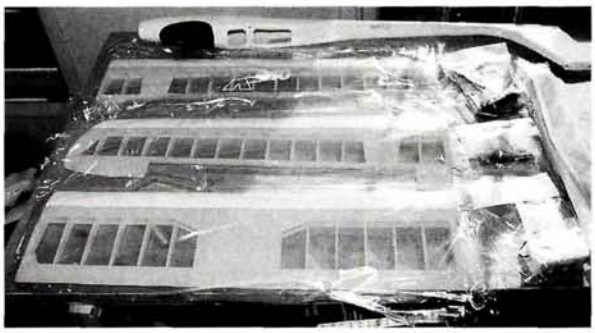
It's really just the proper matching of design, materials and power system—the product of years of experience within the modeling community—paired with time-saving ARF construction in a package that raises the bar. I'm not saying this plane is going to compete with a competition sailplane, nor would you ever want to dive and yank this plane like you would a European F5b-style electric. But when I compare its performance with the many open-bay electric gliders I have built and flown since the mid-'80s, some under 2 meters in span and some over, none have shown the performance capabilities of this particular airplane.



Test pilot Roger Post holds the X610.

ASSEMBLY

Aileron servos are mounted in fairly shallow bays (½ inch deep) using a technique I had not previously used. The SR instruction manual asks that you epoxy-seal the balsa floor of the bay (of course) and that you cover the area where the double-stick tape will be applied with Scotch tape. You are also advised to cover the side of the aileron servo (I used Airtronics* 94501 Microlite servos in conjunction with the Airtronics RD6000 programmable radio reviewed in our August '99 issue). SR owner Larry Sribnick assured me the adhesive qualities of this combination would work well in practice and minimize any challenges should I swap out servos. He was right. Clear plastic "windows" with slots for the servo arm are then simply taped down, and the servo arm and aileron



The kit right out of the box is clearly a highly prebuilt ARF.



Aileron servos are connected to aileron horns via a threaded rod with locked clevises at each end.

control horn are connected by threaded rod with a nut-locked clevis at each end.

This approach worked just fine. If by chance you select any of the really tiny sub-micro servos for this application (the aileron loads are not high, as this is a slow floater), note that you may need to add some balsa posts to prevent "servo rock" (the slight rolling of a servo under stress that is entirely a function of the flexibility of the double-stick tape). No such problem with the 94501s.

Assembly of the model is simple and straightforward. Perhaps the most challenging task is the relatively simple threading of the servo wire extensions into the D-tube cavity of the outer wing panels so that the wires may be subsequently pulled through the servo wire opening into the servo bay for soldering to the servo leads. Not wanting to fish for the wire within the D-tube interior cavity as instructed, I tied a tiny weight (a bolt) to the end of a thread, inserted an outer tube section from an old flexible linkage system into the second interior wing bay through the predrilled holes, and then dropped the weight down the tube and let it fall out the hole leading to the servo bay.

FLIGHT PERFORMANCE



• TAKEOFF AND LANDING

The obvious sailplane takeoff technique is the hand launch. For the climb-out, the X610's Sport System motor and 14x9.5 CAM propeller combination produces an aggressive climb rate for a large floater, but with a considerable left-turning tendency. Accordingly, I needed right-aileron/rudder input to keep the model tracking straight in a fast climb.

To land the X610, use the same technique as you would with any other model: align the sailplane with the runway, use the elevator to control the airspeed and, if needed, use the throttle to gain a little altitude or to reach the runway. Do not stall it close to the ground because the X610 will drop—nose first—3 to 4 feet. Be sure to save some motor power to assist, if needed, in the landing.



When landing, if you have the ailerons work as spoilerons, you can kill the lift that would otherwise cause the glider to float down the runway. Without the spoilers deployed, it will soar on for a very long way in ground effect. It doesn't seem to want to drop those last few feet to the earth! When deployed, the spoilerons required the addition of some down-elevator trim.

• HIGH-SPEED PERFORMANCE

The X610 was designed to be a floater, and it does float very well, so this category doesn't really apply. If it is dived—power off—it can pick up quite a bit of speed. But it's a floater, so don't dive it expecting a high-speed flyby like an F5B ship does; you will only endanger the aircraft by exceeding its design speed.



• LOW-SPEED PERFORMANCE

At one point during the test flights, with the model pointed directly into the 8-knot—gusting to 12—wind, its ground speed was zero—no perceptible forward movement. It can catch thermals and "hang" in the air with tremendous stability.

Many modelers who fly sailplanes without spoilerons have lost them during efforts to avoid the powerful lift of large thermals. This is the electric glider that you can explore "boomer" thermals with. Because of its spoileron capability, you need not worry about its floating up and away; no need to fear that with this grand ship. The power-off stall produces a nose drop as previously noted. To recover, neutralize the elevator and add power; there was no tendency for the wing to drop.

• AEROBATICS

The X610 is designed to be an intermediate electric sailplane and is therefore not set up to produce the wild gyrations of an aerobatic craft. It will do gentle loops, spins and barrel rolls (lots of rudder required), take care to avoid building up excessive speed during a dive.

If your rudder thumb has lain dormant for a number of years, either wake it up or use a computer radio that allows the rudder to be slaved to the ailerons. If you slave the rudder to the aileron stick, I recommend that you use 100 percent rudder deflection. Also, program some aileron differential into the setup by using either the end-point adjustment (EPA) percentages or the aileron differential function in your radio. The adverse yaw that is created by improper aileron deflection, i.e., in the absence of differential, will initially yaw the model a direction that's opposite that of the intended turn.

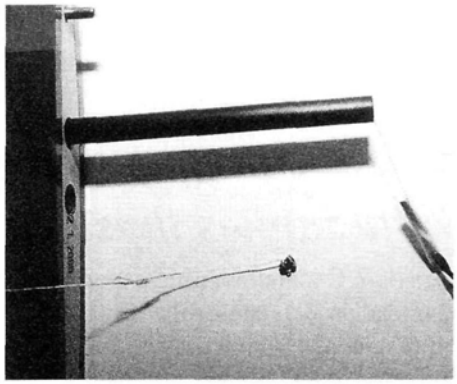
The model isn't pitch sensitive, so a little extra elevator throw wouldn't be a problem. Use as much rudder throw as you can get out of your rudder servo. The manufacturer states that the X610 may be flown as a 3-channel airplane (no rudder), but it recommends the use of the rudder. I concur; without the rudder to help with the model's turning, the mild response on ailerons alone will be an issue.

The X610 can be flown in moderately windy conditions, but be sure to save some power to help you get out of a jam (if you're in mild chop, you don't want the motor to cut off near the ground). The model is extremely light, and turbulent air can toss it around in the air unexpectedly.

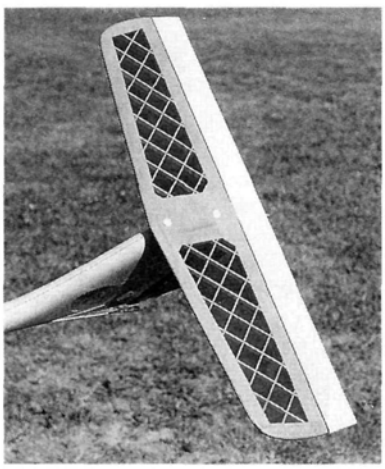
—Roger Post Jr.

The other end of the thread was attached to the servo wires (see photo). I just pulled the wires through by pulling on the thread. Then I cut the servo connectors off the end of the servo leads and soldered the leads to the extension wires and used heat shrink tube in accord with standard practice.

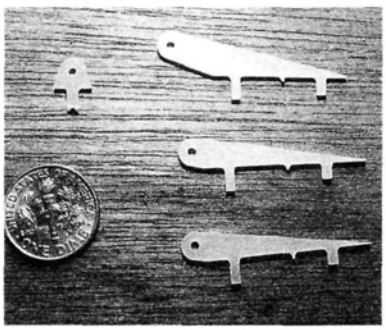
SR provides beautifully engineered epoxy and glass control horns for the ailerons, rudder and elevator (see photo). I at first mistook these fairly thick, rugged fixtures for some type of semi-opaque phenolic. They are designed for modelers who will be using a programmable radio like the Airtronics RD6000. SR also supplies a second set of more conventional-looking horns for modelers who will be using standard 4-channel, non-programmable radios. Whatever your radio type, you will be able to create aileron differential either mechanically with the conventional horns (thoroughly explained in the manual), or via your programmable radio using the custom-built SR hardware.



A tiny weight can be used to guide a thread through the outer wing-panel internal bays and through the small hole into the servo bay. Note the tube used to guide the weight into the second internal bay that opens to the servo bay. The thread is then pulled to guide the servo extension wires to the servo bay.



Note the rugged cross-hatch frame construction of the horizontal stabilizer.

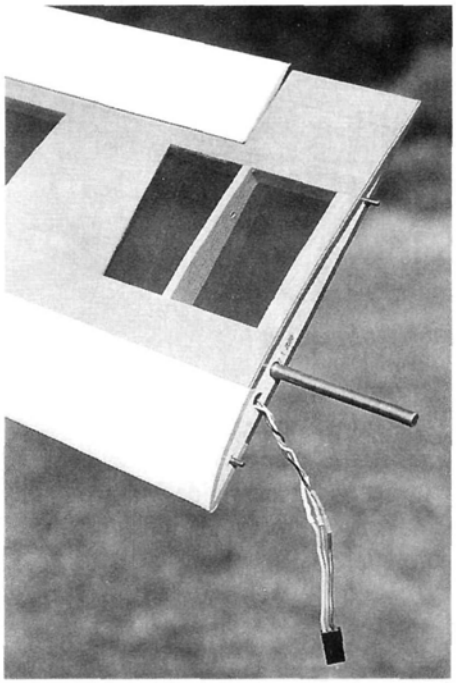


Custom epoxy/fiberglass control horns to be used if you employ a programmable radio.

Mounting the elevator servo was easy, although I did rasp out a slight cavity in the upper extreme inner "lip" of the balsa former that separates the back of the fin sidewalls. I wanted to absolutely guarantee ⅛ inch clearance for the elevator pushrod. Very carefully install the tiny custom-designed elevator control horn because if you recess it farther aft than the instructions say, you can cause subtle problems in the geometry of the setup.

Installing the rudder servo is a real snap, as the mounting rails on which the servo tray is to be glued have been preglued to the inside of the light glass fuselage. You simply mount the servo on the tray, place it roughly in position, center the servo, and connect the supplied linkage to the rudder horn and servo. Center the rudder and then glue the tray down. A snap.

Interestingly, SR advises not piling the epoxy on to strengthen the bond between the preglued firewall and the nose; better to have that firewall slip loose if you accidentally impact the nose of the ship than crack the fuselage. Attaching the motor to the firewall is a real breeze. Three small bolts do the trick. The sport system motor, planetary gearbox, Jeti* speed control, fuse and Sermos connectors come preconfigured, mounted and soldered. That is a real convenience. The hub, prop and spinner assembly is simple and sure. Setscrews are used to mount the yoke to the motor shaft, and the spinner is mounted to the yoke via interior screws that are threaded through the underside of the yoke.



Steel joiner rod and guide wires can be seen at the tip of one of the outer wing panels.

Three nylon bolts hold the center wing panel to the wing saddle, one of which you need to prepare. That is a simple matter of drilling a hole in the aft portion of the panel and through the fuse cross panel at that point, and then mounting a blind nut underneath to accept the nylon bolt. The outer wing panels are connected by short steel joiner rods that slide into preinstalled joiner tubes. Small steel guide pins ensure perfect alignment.

The ailerons, elevator and rudder are all hinged with highly adhesive, strong, clear SR gapless hinge tape (developed by SR with 3M for this purpose). The manual is clear and well illustrated. So, you can see, the airplane is quite easy to build.

CONCLUSION

The result exudes quality. It utilizes an SD 3021 airfoil and is not really designed for high-speed aerobatic flight. For the traditional U.S. sport modeler who likes to fly floater-style gliders, it is a step ahead in materials, workmanship and performance. Despite the relatively inexpensive motor drive system, it climbs with enough power to require torque correction (i.e., a bit of right aileron coupled with right rudder). When landing, the X610 wants to hang in ground effect seemingly forever, so the spoilerons are an immense help (see "Flight Performance"). And it takes very little time to assemble because all the really time-consuming work has been taken care of, right down to installing a fuse in the power system. In my opinion, this all represents genuine progress.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*



The motor, battery, radio receiver and other internal components have plenty of room.

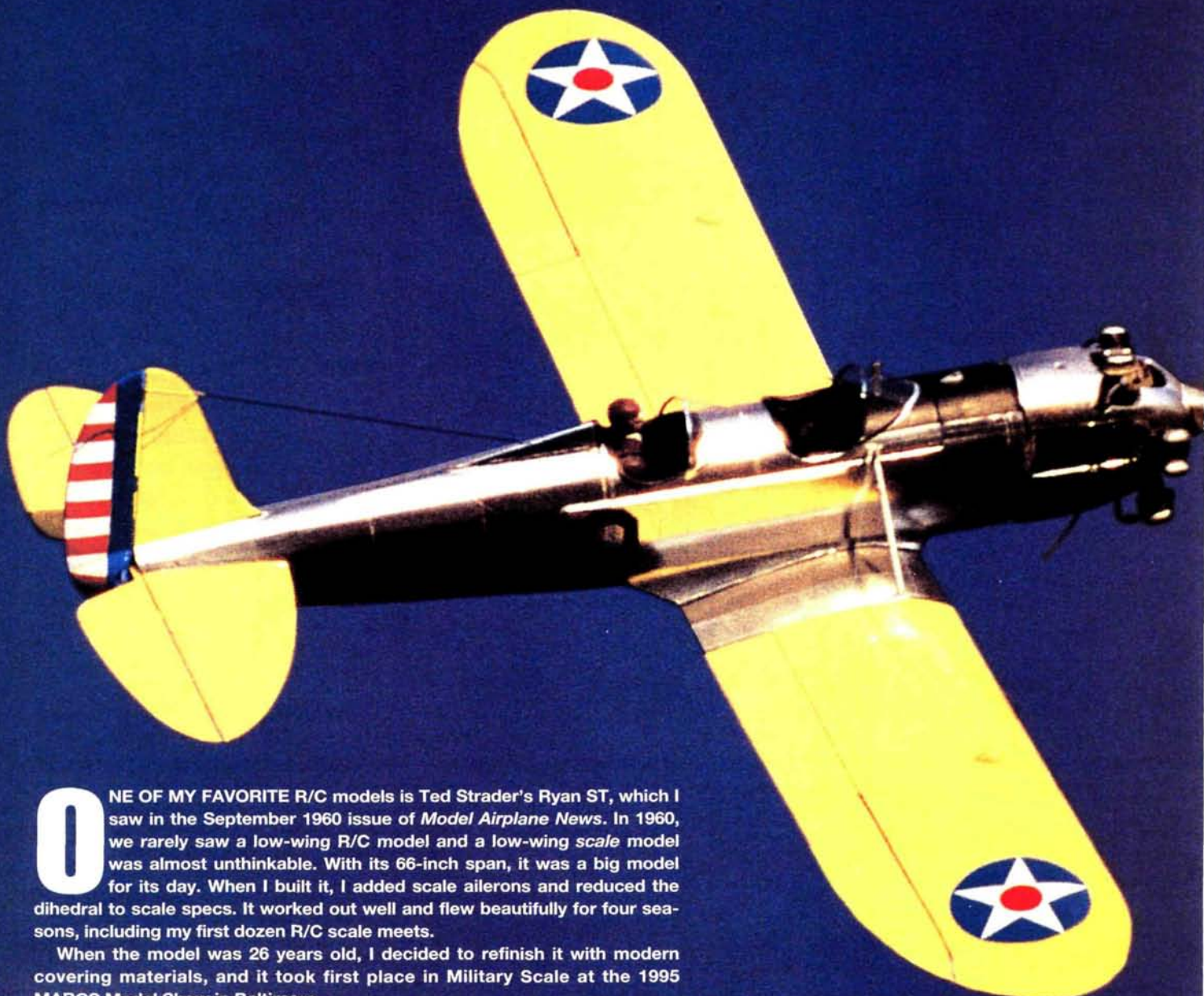
MODEL AIRPLANE NEWS

CONSTRUCTION

THE RYAN ST

by Henry A. Haffke

A sport-scale military primary-trainer



ONE OF MY FAVORITE R/C models is Ted Strader's Ryan ST, which I saw in the September 1960 issue of *Model Airplane News*. In 1960, we rarely saw a low-wing R/C model and a low-wing *scale* model was almost unthinkable. With its 66-inch span, it was a big model for its day. When I built it, I added scale ailerons and reduced the dihedral to scale specs. It worked out well and flew beautifully for four seasons, including my first dozen R/C scale meets.

When the model was 26 years old, I decided to refinish it with modern covering materials, and it took first place in Military Scale at the 1995 MARCS Model Show in Baltimore.

The following year, I flew it at the Rhinebeck scale meet where the editorial staff of *Model Airplane News* saw it and thought it a good subject for a construction feature. I contacted Ted Strader, designer of the original model, and he agreed to let me redraw and modernize his design. He even supplied me with a copy of his original drawings, which were a big help.

The new plans include details for several of the Ryan trainer types, including the prototype ST, the STA, STM and military YPT-16, PT-16 and PT-20 versions. I include details and patterns for building a scale Kinner radial engine, too, so you can build a PT-16A or PT-20A. My model is a PT-20A—the first PT-20 delivered to the military (December 12, 1939). It was converted to a PT-20A in October 1940.

Below: this is the Menasco-powered in-line ST version.
Right: nose detail of the PT-20A version powered by an Enya .53 4-stroke.





SPECIFICATIONS

Model: Ryan ST sport trainer

Type: sport scale

Wingspan: 66 in.

Wing area: 650 sq. in.

Weight: 6 lb.

Wing loading: 21.2 oz./sq. ft.

Length: 48.75 in.

Engine range: .40 to .60 2-stroke, .50 to .70 4-stroke

Engine used: K&B* .40

Radio req'd: 4-channel (rudder, aileron, throttle, elevator)

Comments: designed by Henry A. Haffke, this attractive, relatively easy to build, balsa and ply military trainer has tail surfaces that can be solid sheet balsa or built up for a more scale appearance. The plan shows details for several versions, including one powered by the Kinner radial engine.

FUSELAGE

Start by cutting the sides out of 4-inch-wide 1/8-inch-thick balsa sheet. Unless you can find 48-inch-wide balsa, you'll have to splice sheets together to obtain the necessary length.

The splice is shown on the plans by a diagonal broken line above the wing saddle behind F-2. The sides' basic outlines are shown on the plan by arrow points. Note the portion cut out for the stabilizer.

Once you've cut the sides to shape, mark them for the location of each bulkhead. Be sure to make a right side and a left side while doing this. Note that in the cockpit area, the side formers and top formers are not in line with each other. Mark the locations for the side formers on the outside surface of the side and the locations for the top formers and the 1/4-inch saddle doublers on the inside.

Right behind the rear cockpit are two P-3 bulkheads. Score the outside surfaces of the fuselage sides between these two bulkheads so that you'll be able to crack (and reglue) the sides so that the sides will come together at the rear without bending.

Cut the fuselage bulkhead parts out of the materials shown on the plans. To ensure that both sides will be the same, cut the side formers two at a time (stacked on top of each other). Also, cut two each of the half bulkheads (top and bottom) as shown, and glue the halves together to form one-piece symmetrical bulkheads.

Drill holes in the firewall for the engine-mounting bolts, fuel lines and throttle pushrod. Start the fuselage assembly by sliding the 1/8-inch ply former F-2 into position on the side parts (don't glue it yet). Cut a 2 1/4-inch-long, 1/2-inch-square piece of balsa, and clamp it between the aft ends of the fuselage sides to help keep the tail positioned properly.

Place the firewall flat on your work surface, and stand the fuselage sides on their front ends with the firewall between them. Use a square to keep everything lined up squarely, and epoxy the firewall and former F-2 into place. Now add the 1/2-inch bulkhead F-1 and the 1/2x1/8-inch riser side pieces on top of the fuse sides and in front of F-1.

Next, epoxy the 1/2-inch triangle stock into place behind the firewall. Glue the 1/4-inch-thick wing-saddle doublers into place against F-2. On the plan, the saddle doublers are shown by dark arrows. Install all the F-3 bulkhead parts (F-3SA, F-3SB, F-3S and F-3T) back to the first complete F-3 bulkhead just behind the cockpit. Let the glue set before proceeding.

"Crack" the sides so that the rear fuse sides can be bent inward, and make sure that the fuselage remains straight. It is a good idea to place a 1/4-inch-square stringer (without gluing) in the top and bottom stringer cutouts to help maintain the rear section alignment.

When you're satisfied that the sides are properly aligned, glue the F-7 bulkhead parts into place. Now run a bead of CA along the crack in the sides, and add the second set of F-3 bulkhead parts, followed by F-4, F-5 and F-6 bulkheads.

TAIL PARTS

The tail surfaces can either be built up of 1/4-inch stick parts as shown, or they may simply be cut out of 3/16-inch-thick balsa sheet. The lower part of the rudder has a soft, 1-inch-thick, balsa-block fairing glued to each side. To save weight, hollow out the blocks before you glue them into place. Be sure to test-fit all the tail-surface parts, and hinge them together temporarily before proceeding.

This is a good time to set up your servo installation and the rudder and elevator pushrods, both of which will be concealed in the rudder fairing when the model is finished. To ensure enough rudder-pushrod clearance, you'll have to make a cutout in the rear of the fuselage side. Once you've set up the controls, you can remove the tail surfaces and return to the fuselage structure.

BACK TO THE FUSE

Glue the center top, bottom, right and left side stringers into place, then add the remaining stringers. Note that you will have to install the stringers in two pieces; they are cut at the F-3 bulkhead location. This is to keep the stringers straight aft of F-3. The real aircraft's rear section wasn't curved, and this feature makes covering the fuselage a much simpler operation.

Add the 5/16x1/4-inch stab base that goes behind F-5 and goes to the top edge of the center side stringer, then add the plywood tailwheel mounting plate and set up the tailwheel installation as shown on the plans.

Epoxy the maple wing-mounting blocks to the inside of the saddle doublers, then sheet the entire fuselage structure with 3/32-inch balsa sheet.

Cut out the cockpit openings and make the headrest of a soft, 1-inch-thick balsa block, and the fuselage structure is basically finished.

FLIGHT PERFORMANCE

• TAKEOFF AND LANDING

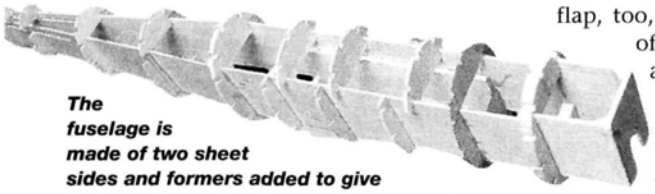
The Ryan ST has ideal proportions for an R/C model, and if you make everything straight, it's a great flying bird. It is a tail-dragger, so you should apply throttle slowly for takeoff and hold the tail down a little at the start. Once it is moving solidly, you can let the tail rise, and the model lifts off easily.

The Ryan slows down nicely when throttle is reduced, so there aren't any problems here. Just get the tail down when it settles onto the ground, and stay on the rudder until it comes to a stop.

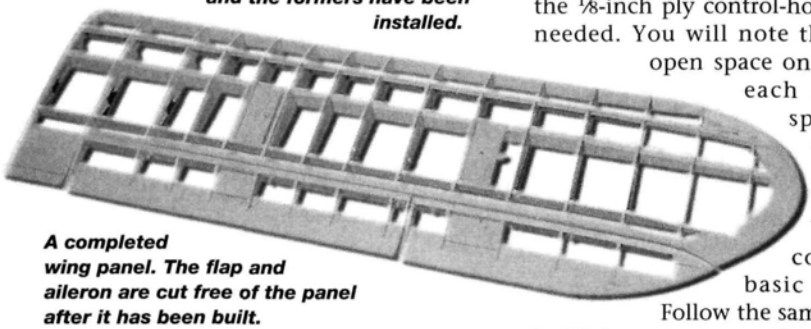
• AEROBATICS

My model is a real joy to fly, and it does very realistic aerobatic maneuvers. It loops and rolls well and flies well inverted with a little down-elevator. It does great spins as well. I am not a hotshot pilot and consider myself adequate at best, but I have no trouble doing these maneuvers smoothly with the Ryan.

A few far better pilots than I have flown the model and really liked it; they did more complex maneuvers, such as 4- and 8-point rolls and knife-edge flight.



The fuselage is made of two sheet sides and formers added to give it shape. Here, the firewall, saddle doublers and the formers have been installed.



A completed wing panel. The flap and aileron are cut free of the panel after it has been built.

WING

Decide whether you want operational wing flaps, then cut ribs l-A and 2 accordingly (see rib details on plans). Cut out all the wing ribs and prepare the wing spars by tapering their outer ends as shown on the plans.

Working on a level surface with the spars raised above the plan sheet with ¼-inch risers, position the main and rear spars over the plan, mark the rib locations and then glue the ribs into place. When the ribs are in place, the LE and the ⅜x¾-inch sub-spar, which separates the flap and aileron from the main wing, can be added. If you don't use flaps, extend the aileron inboard ¾ inch so it will end at the sixth no. 2 rib.

The TE is built of 1½-inch-wide, 1/16-inch balsa sheet with a ⅛x⅝-inch strip glued on the top rear of the sheet. Cut off the rear part of each rib as necessary to accept the TE. Build up the ailerons (and flaps, if used) by tack-gluing the 1 1/16x¼-inch LE to the sub-spar. Then add the TE and glue the ribs into place. Finish the aileron with the 1/16-inch-sheet tip parts.

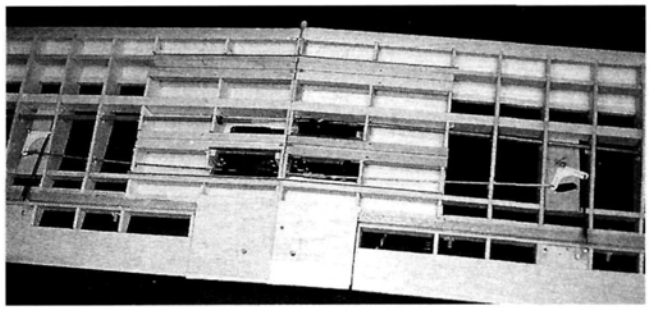
Glue the ½-inch balsa wingtip parts into place, then glue in the 3/16x½-inch spruce front spar followed by the ¼-inch-square top main spar.

Next, roughly shape the wingtip parts, and taper the TE. Also carefully taper the top of the aileron LE to the shape of the outer ribs as far as the tip. Shape the tip so it flows smoothly from the no. 2 rib down to the thinner tip ribs. Finish the job with sandpaper and a sanding block. When you're satisfied with the tip's shape, cut the aileron free of the wing (and cut the flap, too, if used), and shape the bottom of the LE and the rear of the wing as shown in the "Aileron and flap detail" drawing on the plan.

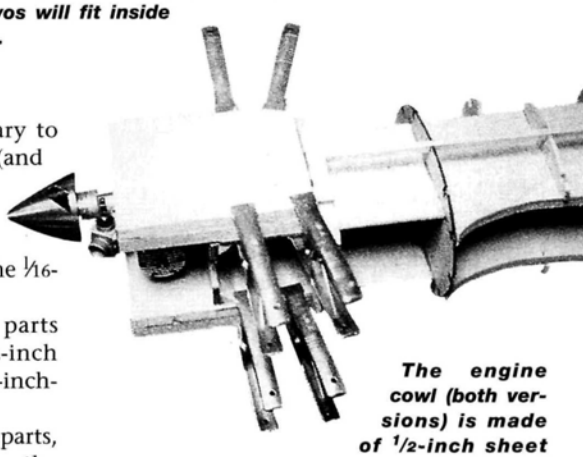
Make the ⅛-inch-ply bellcrank plates as shown—two for the ailerons and two for the flaps (if used)—and glue them into place. Add the ⅛-inch ply control-horn plates where needed. You will note that there is an open space on the bottom of each rib below the spars. Fill each one with a short length of ⅛-inch-square balsa. This completes the basic wing panel. Follow the same procedures to build the opposite panel.

Join the wing panels with two, ⅛-inch, birch-ply dihedral braces. Test-fit them together, and check the joint. If necessary, sand the end ribs to get a perfect dihedral joint. When you're satisfied with the joint, epoxy the dihedral braces into place, and make sure that the panels are properly aligned with each other. Place the wing on two, 1-inch-square, 8-inch-long blocks placed 30 inches apart. Make sure that the center wing joint doesn't touch the work surface, and adjust the blocks so that they sit squarely between two ribs and the LE and TE sit flat on top of the blocks. The dihedral braces give the wing its correct scale dihedral, and the use of this method ensures that when the epoxy has cured, the two panels will be perfectly aligned.

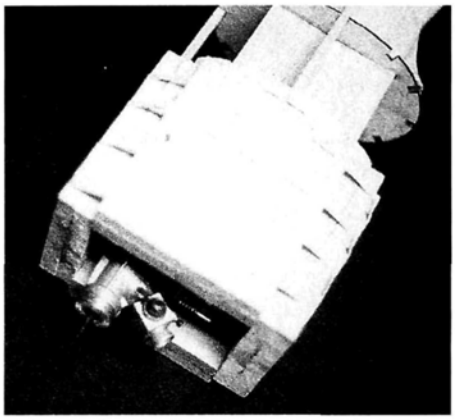
Drill a ¼-inch hole in the center of the LE, but do not drill into the dihedral brace. Epoxy the ¼-inch wing-mounting dowel into place, then glue a length of ¼x1-inch TE stock between the TE sheeting inboard of rib lA on each panel. This is where you'll drill the wing-mounting-bolt holes when you join the wing to the fuse.



This view of the wing center section shows the landing-gear mounting blocks in place in the bottom of the center ribs. The tops of the aft blocks must be trimmed so that the aileron and flap servos will fit inside the wing.

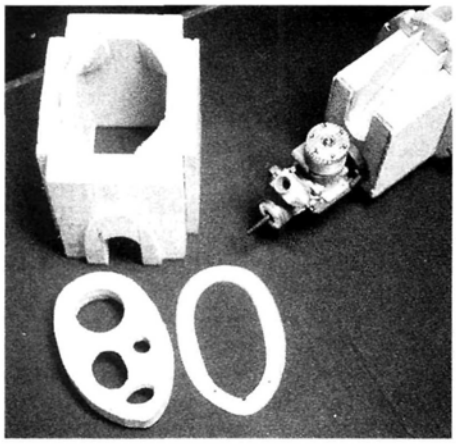


The engine cowl (both versions) is made of 1/2-inch sheet balsa. Here, the side pieces have been tack-glued into place in front of former F-1 with the firewall between them. Cowl former C3 is between F-1 and the cowl parts. Below: the top and bottom cowl parts are tacked into place until the glue dries.

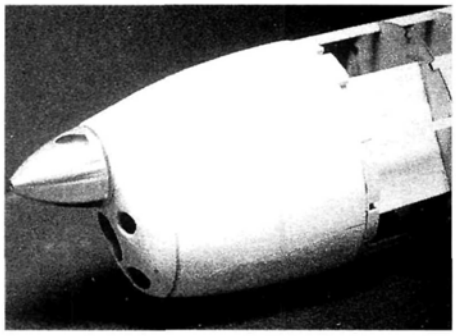


Epoxy the front 3/8x3/4-inch maple landing-gear blocks into place, and fit (don't glue yet) the rear blocks into place. Mark the top of the rear blocks where the aileron and flap servos will go, and make a 3/16-inch-deep cutout on the top of the blocks so that the servos will fit in the wing. Having done that, epoxy the rear blocks into place. Hinge the ailerons (and flaps) to the wing, and set up the servos and linkage.

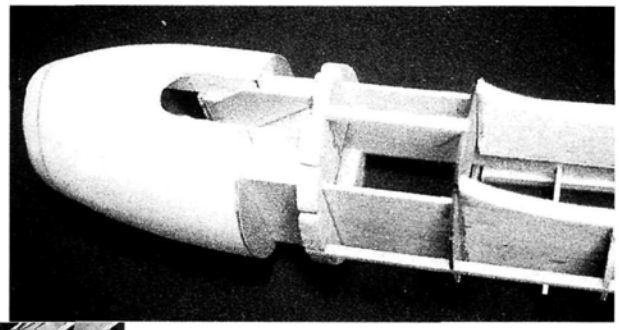
Before you sheet the wing, you must install the four landing-gear wires. Bend them as shown on the plan, and be sure to make a left gear and a right rear gear; the two front gear wires are identical. Install the wires in the gear blocks, then drill an 1/8-inch hole through each block, 1/4 inch outboard of the center rib, to fit the vertical gear wires. Secure the gear wires in place with nylon straps and screws. Bind and solder the wires together, making sure that the angle of the front wire is as shown on the side-view drawing. When you've finished, remove the gear from the blocks, and complete the wing sheeting. The center-section top and bottom should be sheeted outboard to the lA ribs.



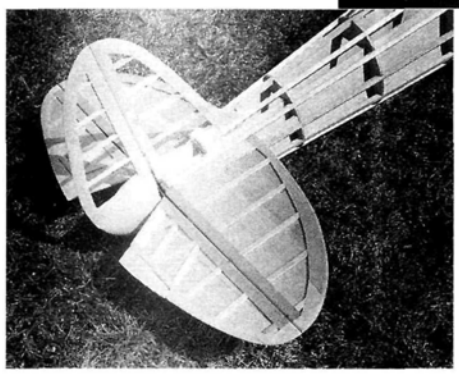
The cowl parts have been removed from the fuselage and form a basic box structure. The front cowl parts (C1 through C3) have been cut out and are ready to be tack-glued to the cowl sides.



The cowl parts have been glued together and then carved and sanded to shape.



Right: the cowl can now be slid off the front of the fuse. Note that the opening in the bottom of the cowl fits around the cowl duct parts already in place between the firewall and former F1. Below The tail parts can be built up or made of sheet balsa. Note the fairing blocks added to the bottom of the rudder.



WHEEL FAIRINGS

Cut the WF-l front and rear parts out of 3/32 ply, and cut WF-2 and WF-4 out of 1/4-inch balsa. Cut the WF-3 parts out of 1/2-inch balsa. Stack the four front and four rear WF-l parts together, and where shown on the plan, drill two 1/16-inch holes through them for the dowel-alignment pegs.

Now glue the parts for one half of the fairing together; weight the stack down until the glue has dried, then make the second half. When the glue has dried completely, drill slightly deeper holes in the balsa, and glue in the 1/2x1/16-inch alignment pegs.

To form the fairings, put the halves together (placing the pegs of one half into the alignment holes of the other half), and carve and sand to final shape. With the fairing halves completed, fit the inside fairing half against the landing-gear wires, and epoxy the two 3/16-inch ply triangular and rectangular parts that hold the fairing in place on either side of the rear gear wire.

When you've finished the rest of the model, install the fairings by spot-gluing the fairing halves together around the gear wires. Because they're made in this way, during a rough landing, they pop off the gear wire with relatively little, if any, damage.

If you'd prefer not to carve your own gear fairings, you can use the Sig* Ryan ST fiberglass wheel fairings, for which you need only to make the WF-l and WF-2 upper fairing parts. The Sig fairings are about 1 inch longer than the parts shown on the plan. For sport scale, that's acceptable.

THE ENGINE

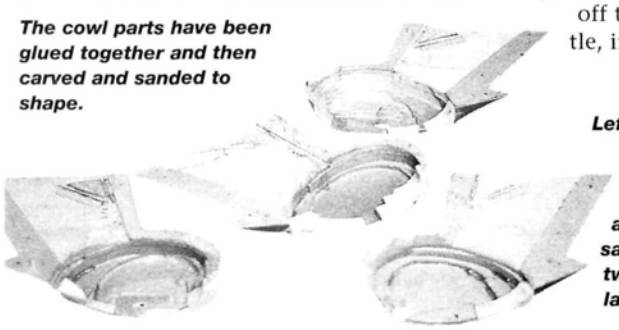
• **Cowl**. This is built up with 1/2-inch sheet balsa (the in-line Menascoe engine cowl is shown in the photos). The Kinner radial-engine version is built in the same way but uses different formers, as shown on the plan, and requires a built-up spinner. Also, the radial-engine version requires an upright engine installation, and this means that the engine mount must be lower on the firewall. The model engine that protrudes from the cowl takes the place of one of the five dummy engine cylinders.

• **Engine-cooling duct**. For the in-line inverted engine, you have to cut a lx2-inch opening in the bottom center of the firewall. Cut the five cooling-duct parts out of 1/8-inch balsa (two CD-l parts required), and glue them together as shown in the cowl side view. Sand the inside smooth, and fuelproof the inner walls. Glue the cooling duct into the firewall opening and against former F-l. Cut an opening in the bottom of the cowl so that the cowl can slide past the duct and back against F-l .

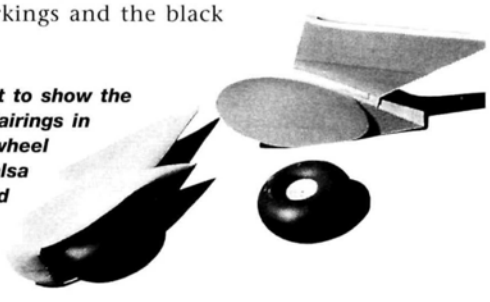
COVERING

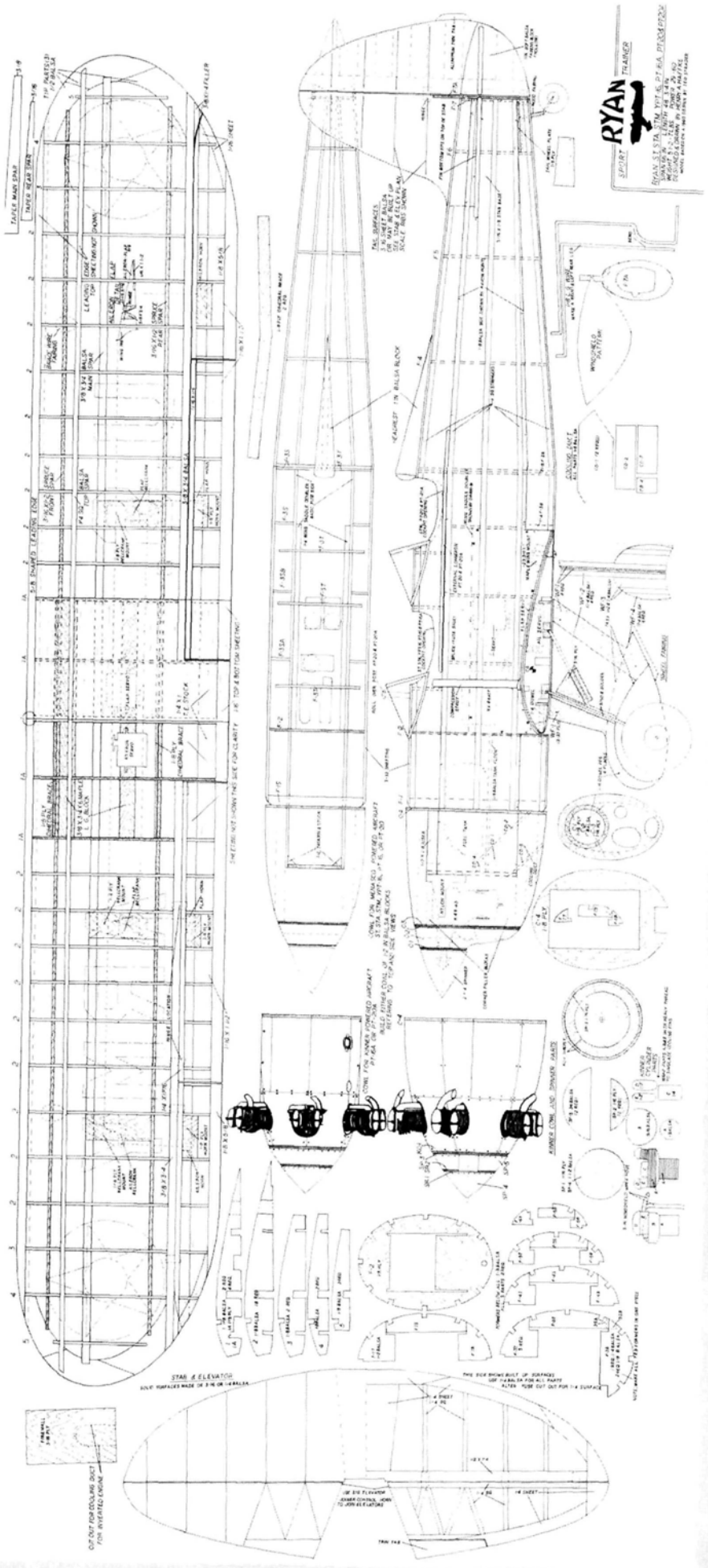
Before covering, I glued the hinges into the stab, fin and wing. I gave the model a coat of Balsarite* before covering it with Coverite's* aluminum Micafilm and yellow 21st Century* fabric, which I also used for the trim on the flying surfaces.

I cut the wing's star roundels, the rudder's red, white and blue markings and the black

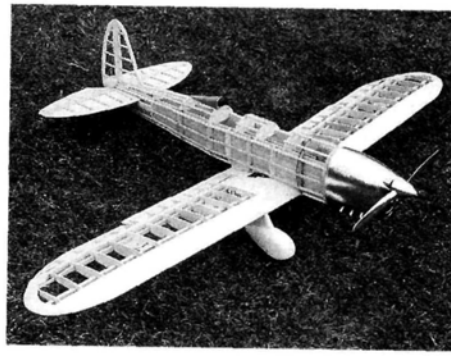


Left: the gear fairings have been taken apart to show the triangular plywood pieces that hold the fairings in place around the gear wires. Right: the wheel fairings are made of several layers of balsa and plywood that have been carved and sanded to shape. Each fairing is made in two halves that are tack-glued around the landing-gear wires.





TO ORDER THE FULL-SIZE PLAN, FSP11991, SEE PAGE 136



"U.S. ARMY" letters (bottom of the wing) out of 21st Century fabric and ironed them into place. The fuselage, wheel fairings and wing center section are all covered with aluminum Micafilm, which gives a very realistic aluminum finish (not chrome-looking).

I also used a little Coverite Chrome Presto to finish the external longerons below the cockpits, and the black "50" on the fuselage came from Coverite's Graphics trim sheet material.

FINAL ASSEMBLY

Place the fuselage, inverted, in a cradle, and fit the wing onto the fuselage wing saddle. Mark the position of the wing-mounting dowel on former F-2 and drill a ¼-inch hole for it. If necessary, alter the hole with a round file so that the dowel fits it and the wing sits squarely in the saddle. Make sure the wing is square to the fuselage centerline and that the distance from each wingtip to the tail is the same, then drill through the wing into the center of the wing-mounting blocks with a no. 25 drill bit.

After you have installed the ½x4x1/16-inch-thick ply reinforcement strip over the drilled holes, remove the wing and enlarge the holes in the wing with a no. 7 drill bit. Tap the wing-mounting blocks with a 10-24 tap, and secure the wing to the fuselage with 1-inch-long 10-24 nylon bolts.

Turn the model over, and fit the tail surfaces into place. Make sure the stab is lined up perfectly with the wing. If it isn't, sand the stab slot on one side to correct the misalignment. When you're satisfied with the alignment, glue the stab into place, and then glue in the fin (be sure it is perpendicular to the stab).

Glue former F-7A into place against F-7, the stab and the fin post. Install the rudder and elevator, and hook up the pushrods and horns. Install the ailerons (and flaps, if used), and then install the fuel tank and radio gear as shown.

If the Ryan ST is one of your favorites and you decide to build one, I hope you will enjoy yours as much as I do mine. It is a beautiful airplane in any of its configurations.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

READER'S GALLERY

by Debra Sharp

Pfalz D.IIIa

Tom Polapink loves WW I aviation, and he has designed and built a fleet of early warbirds to prove it. His latest creation, this ¼-scale Pfalz D.IIIa, earned a static score of 96.75 and flew beautifully at this year's Top Gun, the most prestigious scale invitational in the country.

* * *

Tom's Pfalz is made mostly of balsa and has hardwood spars and plywood formers and ribs for extra strength in some spots. To create the distinctive Pfalz shape, Tom built the fuselage on two vertical, sheet-balsa crutches and slipped the formers into place; then he sheeted it with ⅛-inch-thick balsa and fiberglass. He covered the wings and tail with Super Coverite* and finished the entire model with Sig* dope.

* * *

Tom commented, "Documenting the Pfalz's colors was a little tricky because every artist's rendering of this particular aircraft—and there have been quite a few—has shown the separation line between the red and blue on the fuselage to be at the center of the cockpit. A letter in Windsock Intl. a few years ago stated that this was incorrect and that the color separation should be at the rear cabane strut. Eventually, I contacted Ray Rimmel, who puts out Windsock Intl. and Windsock Datafiles, and he sent me a good-quality copy of the photo, which was a great help."

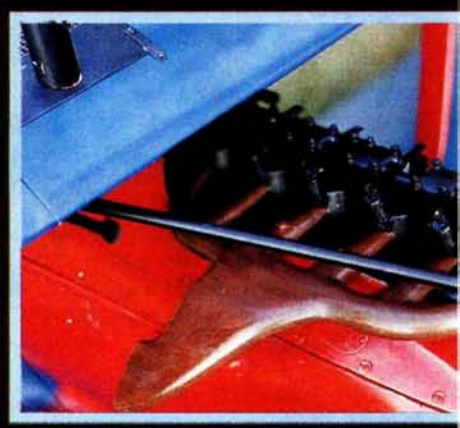
* * *

In his spare time, Tom volunteers at the Old Rhinebeck Aerodrome in Rhinebeck, NY, and is there just about every weekend from June through October. He encourages other modelers to stop by and adds, "The Aerodrome is a great place to visit and it is definitely where I developed an interest in early aircraft at an early age." Sounds like a match made in heaven.









SPECIFICATIONS

Model: ¼-scale Pfalz D.IIIa

Designer/builder: Tom Polapink

Type: WW I fighter

Wingspan: 94 in.

Weight: 22 lb.

Engine: Moki* 1.8

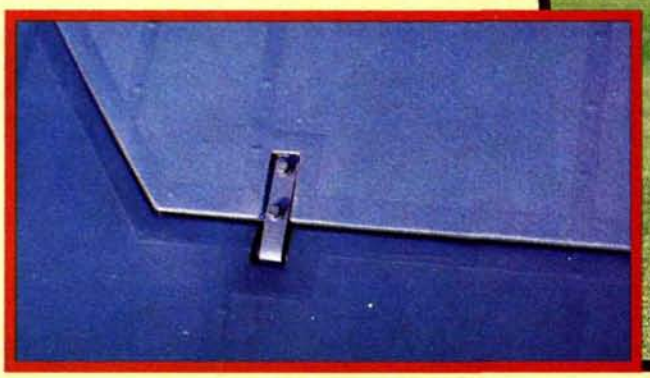
Radio: Airtronics*

Construction: balsa, hardwood and plywood

Finish: Super Coverite and Sig dope

Time to build: two to three years

Comments: Tom placed fifth in the Top Gun '99 Designer Class with this model, which is painted in German WW I pilot Rudolph Berthold's "winged sword" colors.





A winning ticket to IMAA aerobatics

OHIO R/C Extra 300L

by Michael J. Kuper

I've heard many modelers say that if it looks right, it probably flies right. From the Extra 230 to the 300L, this principle is clearly illustrated in the aerobatic airplanes produced by Walter Extra. All of his designs have classic proportions and lines, and they are also proven performers. The 300L is the tandem-seat version that replaced the original 300.

I'm an active IMAC Scale Aerobatics competitor, and for this year's Unlimited class competition, I chose to build the Ohio R/C* Extra 300L. A large airplane that is part of Ohio R/C's Monster Series, the 300L features a two-piece, tube-mounted wing that spans 102 inches; this makes it 33-percent scale. This kit differs from precision scale in that the fuselage is slightly stretched to provide its excellent flight characteristics. Ohio R/C's planes have a proven track record in scale aerobatic competition.





SPECIFICATIONS

Name: Extra 300L

Type: sport/aerobatic

Manufacturer: Ohio R/C

Wingspan: 102 in.

Wing area: 1,980 sq. in.

Wing loading: 30.2 oz./sq. ft

Length: 92 in.

Weight: 26 lb.

Engine req'd: 4.2 to 6.4 2-stroke

Engine used: Brison 6.4

Prop: 26x12 Mejzlik Modellbau carbon fiber

No. of channels req'd: 4

Radio used: Futaba 9ZAW

Price: $499.99

Features: machine-cut parts, tube-mounted wing, plans and manual included; scale looks.

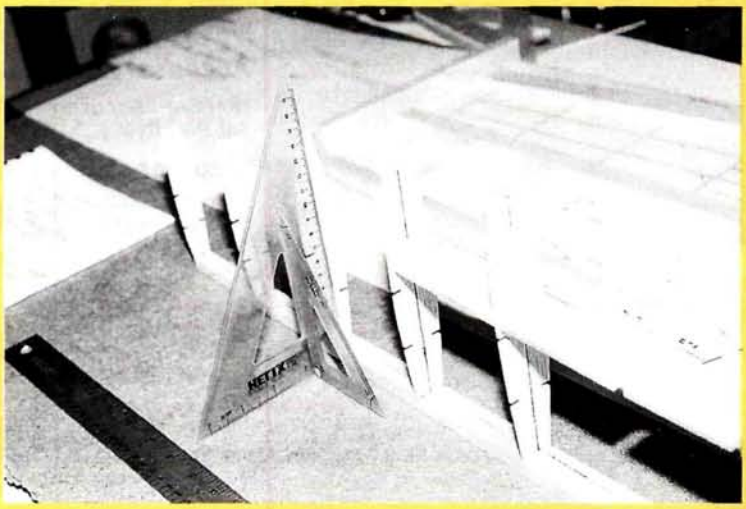
Comments: the Extra 300L combines choice materials, sport-scale looks and speed into a package that will handle anything from low-speed joy-riding to high-speed aerobatics.

Hits

- Kit includes aluminum gear, control panel, hardware and fiberglass cowl and wheel pants.
- High-quality wood and 6-inch sheeting.
- Superior flight characteristics.

Misses

- Difficult to fit wing root sheeting to fuselage.
- Fuselage flexes under canopy.



When assembling flight surfaces and other parts for which exact, 90-degree angles are a necessity, I use two triangles glued together to form a tool that can help form perfect perpendiculars.

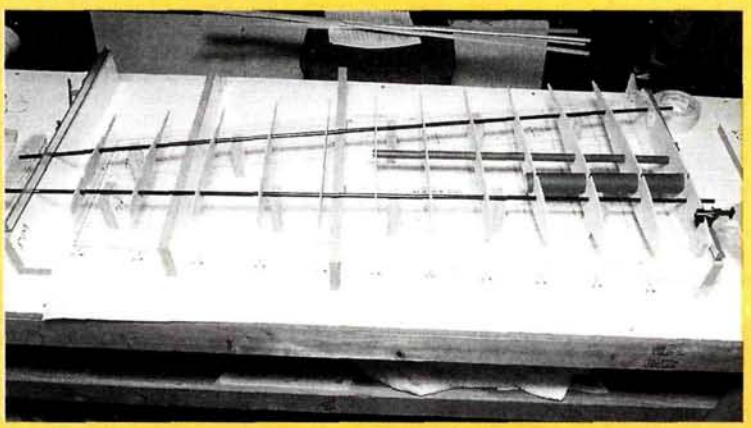
All of the parts come nicely packed and undamaged. The kit includes a clear canopy; high-quality, fiberglass, two-piece cowl and wheel pants; aluminum landing gear and a hardware pack. The wood is all machine cut (no die stamping) and is also of high quality; Ohio R/C is one of the few manufacturers that still mills its own balsa. The Extra also comes with 6-inch sheeting that eliminates the need to join sheets in some assemblies. I weighed the provided sheeting and sticks and found a mix of balsa ranging from 5.5 pounds per cubic inch to 8.5; the heavier, harder balsa will form the longerons and other parts where strength is needed, while the lightweight wood is for other areas. A 28-page instruction manual accompanies the two rolled sheets of plans. This kit assumes a certain level of experience on the builder's part; you must pay close attention to the plans and not merely rely on the construction manual to guide you.

WING ASSEMBLY

The plans include full-size line drawings of both the right and left wing. The supplied plywood jig allows you to assemble the wing over the plans, but I decided to use my ¾-inch melamine jig.

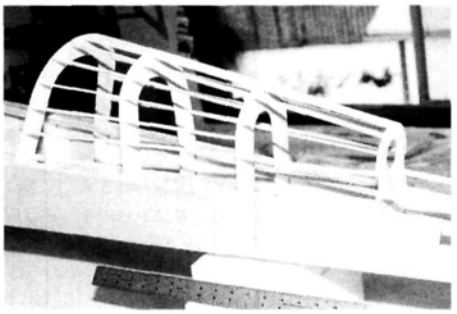
You must decide where to position the rib holders. First, cut the wing plan to separate each wing panel, then draw the rod positions on the plans to make sure that they won't interfere with the construction. To minimize any inaccuracy caused during setup, I tried to position the rods as far away from each other as I could. Next, draw a centerline down each rib from the leading edge (LE) to the trailing edge (TE) to mark the rod position. I positioned the forward rod parallel to the main wing spar and about 1 inch in front of the spar. After putting the rear jig rod parallel to the TE and behind the rear shear webs, carefully drill holes into each rib so you can position the rods.

Tape the plans onto the jig base and make sure that the spar is perpendicular to the end board; then thread the ribs into place by inserting the front rod, spacing the ribs over the plans and then carefully inserting the rear jig rod. The jig will support the rods, which should be clamped into place. The weight of the rods and ribs will cause the middle of the rod to sag slightly, so place the temporary supports under it. Now measure the rib height above the jig base to ensure that everything is straight. As you construct the wing, the spars and stringers will interfere with the 3x24-inch temporary supports, so remove them and place the 2-inch supports wherever possible along the length of the rod.



The ribs are built over the plans. Here, the ribs are aligned on a jig and are ready for the spars to be attached.

At this point, you reach one of the most time-consuming parts of the wing construction. After inspecting and measuring several times, you can position and glue the spars and stringers. I used Ohio R/C SI 1500 industrial grade CA on the main spar, which is spruce, and Balsa USA* Gold CA on all of the balsa parts. The main spar is doubled for the first 18 inches; when cutting the doubler, taper the end to avoid stress concentration. The first four ribs (W1-W4) are lite-ply because they contain the wing tube. I installed the wing tube, and I also installed a servo guide tube through ribs W1 to W7 before



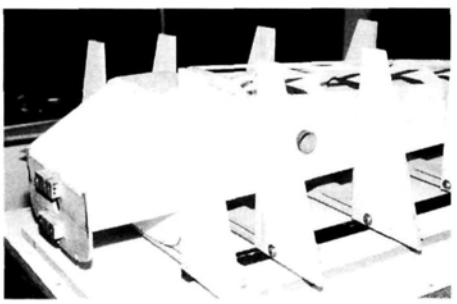
The turtle deck is framed. Construction of the turtle deck is straightforward.

clamping the jig rods in place. (Lightweight tubes are available from TNT Enterprises*.) Before you glue the spars into place, make sure that you have the root rib (W1) set at the proper angle. After the spars and stringers have been glued in, flip the assembly over and do the other side. Make sure that you have the wing bolt plates and hinge blocks installed before you sheet the wing. I don't recommend removing the jig rods until after you attach the shear webs and sheeting. When sheeting the wing, you are instructed to leave a ½ inch of overhang at the root rib to be cut later, but I found ½ inch to be inadequate. I recommend leaving at least 1 inch of overhang.

You are now ready to shape the wing's leading and trailing edges. I used a Master Airscrew* planer and a sanding block for this process. Cut out the ailerons, glue the balsa-facing material, and mark the hinge lines. Ohio R/C assumes that you have your own method for installing servos, so the position is marked (between W7 and W8) on the plans, but no servo trays are supplied.

TAIL FEATHERS

The elevators, vertical fin, rudder and horizontal stab are built up out of balsa, much like the wing. The manual instructs you to mark the centerlines of the ribs, pin the TE to your work surface then glue the ribs to the TE. You maintain alignment by making certain that each rib is positioned square to the TE, with the centerline forming a 90-degree



A Gator R/C jig holds the fuselage in place while the firewall is attached. Check the distance between the engine backplate mount and the prop driver face before attaching the firewall.

FLIGHT PERFORMANCE



The flight characteristics of this plane are pure Extra: very responsive, yet smooth flying. I set the aileron travel at 17 degrees up and 15 degrees down, the elevator at 11 degrees up and 13 degrees down and the rudder at about 20 degrees of throw. This is a low-rate setting for precision flying (for 3D maneuvers, control surfaces can have up to 30 degrees of travel). After a few trim passes, I put the plane through several of the Unlimited maneuvers. I can safely say that this plane will be competitive at the Unlimited level. It snaps beautifully and is one of the easiest planes to put through an axial aileron roll I have ever flown. After a dozen flights, I am so impressed that I plan to build another as soon as possible!

• TAKEOFF AND LANDING

I started the plane on a grass runway. Its takeoff is uneventful with the 6.4 Brison at half throttle, and a scale-type takeoff requires only slight right rudder. The tailwheel comes up easily, and a smooth transition into flight follows soon after. There is ample power to take off in 50 feet or less, and there is enough power to climb out vertically, if you so desire. The plane is very stable under acceleration and climb-out.

The 300L's slow-flight stability makes landing a piece of cake. Just set up early enough to bleed off speed (as with most Extras, the airframe doesn't slow down quickly). The glide slope is easily adjusted with throttle, and once in ground effect, the plane will settle itself gently. Deadstick landings, however, require energy management. If you allow the plane to slow excessively before you are over the runway, it will stall and fall to the ground early. I had one deadstick landing in which the throttle servo was maladjusted (switching to a 3D flight condition during a spin killed the engine). If you keep the nose down and trade altitude for speed, you can set up for the base leg. The turn to final approach will slow the plane for landing.

• LOW-SPEED PERFORMANCE

Slow flight is stable with no tendency to tip-stall, and tight, coordinated turns are effortless. Stalls are straight without dropping a wing, and the plane will appear to be absolutely motionless for a moment before entering a spin. A touch of rudder will initiate the rotation, but the spins stop as soon as the controls are neutralized. With the elevator set to high rate (30 or more degrees), the plane can be held practically motionless with the nose high into the wind. At this attitude, using rudder control while holding full up-elevator and carefully managing the throttle will allow you to fly at a slow walking pace.

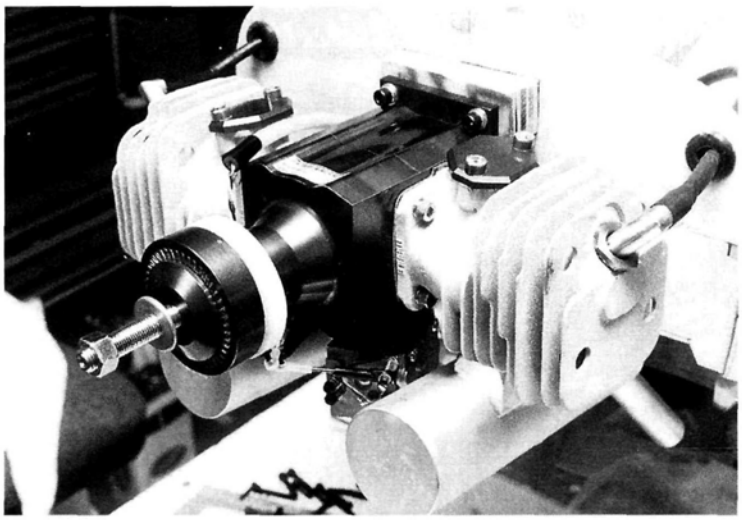
• HIGH-SPEED PERFORMANCE

Aerobatic flight is not really a high-speed event; however, the Extra 300L can be flown quite fast while remaining smooth. When I tried a Menz* Ultra 26x12 prop, the motor gained about 300rpm, and the plane accelerated like a rocket. Unfortunately, the noise level also rose proportionately. At high-throttle settings, knife-edge flight is easily accomplished while holding less than half of the rudder deflection available. Full rudder will allow you climb into a knife-edge loop! A trim change is not necessary at slow speeds, unless you fly very slowly.

• AEROBATICS

Snaps are easily performed, and rotation stops on command. The plane has a slight tendency to pitch toward the wheels with rudder application; there is almost no roll coupling. There is ample rudder authority and, therefore, no need to enlarge the control surfaces. Inverted flight is very stable and requires only a minimal amount of down-elevator to hold a line. With the power available from the Brison 6.4, vertical rolls are limited only by your eyesight, and the plane accelerates nicely out of vertical snap rolls. With the 300L, the only limitations to aerobatic flight reside in the pilot's thumbs.

angle to the work surface. I found this method to be difficult, so I made a simple alignment tool by gluing two plastic triangles together perpendicular to each other. After cutting a notch into the bottom corner of the triangle to allow for the TE, the triangles could be positioned against the centerline. This way, you can simultaneously align the rib 90 degrees to the TE and 90 degrees to the work surface.



A Brison Aircraft Engines 6.4 gas-powered engine can be mounted with no extra adjustment to the firewall or cowl when used with a Bisson Custom Mufflers muffler and CH Electronics 1/4-32 spark plugs.

FUSELAGE

I used another jig when I built the fuselage. I joined another piece of 3/4-inch melamine countertop material with 5-foot guide rails and Gator R/C* giant-scale jig stations. Measure the plans using the fuselage top view, then pencil in the jig station locations, which can be installed in the proper position on the guide rails. Join the fuselage front with the rear sections, and add doublers and the 1/4-inch stringers. You can then mark the sides for the former locations and place them upside-down in the jig. Measure everything at least twice and check the location of the wing tube cutouts to ensure that the fuselage sides are squared up. After the fuselage sides have been completed, it's a piece of cake to glue the formers and longerons.

Because I installed a Brison* 6.4ci engine in this plane, I was able to install the firewall where the plans indicate. Check the distance from the engine backplate mount to the prop driver face before you glue in the firewall because you may need to make adjustments. Install the wing tube and use it as a reference point when you measure the alignments. Again, I used Ohio R/C SI 1500 industrial grade CA on all of the hardwood and ply joints and used Balsa USA CA everywhere else, except for the firewall and gear plate. On these parts, I used Ohio R/C IVC HP Black 1000 industrial CA, which is useful for high-vibration areas. If the fuselage is square in the jig, aligning the firewall is easy. I made a stand-off mount laminated with end-grain balsa and ply to give adequate clearance to the cylinder head and to set right thrust into the engine.

Now you can remove the fuselage from the jig and build the turtle deck. This stage is straightforward, and I encountered no problems. The removable cockpit, which is 32 inches long, is then easily built on the fuselage, providing excellent access inside the fuselage but also weakening the structure. The fuselage flexed underneath the cockpit more than I was comfortable with, so I added diagonal trusses of 3/8-inch-square hard balsa under the cockpit from F8 to F7, from F7 to the center brace and from the center brace to FTl. This stiffened the fuselage considerably. The 300L kit includes two realistic control panels, and I added a Hangar 9* 1/3-scale civilian pilot bust.

At this point, you can install the wings loosely on the wing tube. Position them so that the centers of both the LE and the TE are at the same distance from the thrust line. To ensure accurate incidence, I installed wing incidence adjusters. At the root, scribe a line parallel to the fuselage side on the sheeting, then trim the sheeting to fit. I thought the sheeting that overhangs the root ribs would be prone to damage, so I glued a 3/16-inch-square balsa doubler to the inside of the sheet about an 1/8 inch back to strengthen this area and make it fit tightly against the fuselage. Cut grooves in the doubler to allow it to bend, then match the doubler to the curvature of the sheeting. Next, spread a thick microballoon and epoxy mixture along the inside of the sheeting between the edge and doubler. Then line the fuselage side with wax paper and install the wing. I used Anchor Bond* 30-minute epoxy and found the measured pumps to be very nice to use.

After aligning and installing the horizontal stab, you install the vertical fin. Getting an airfoiled fin perfectly perpendicular to an airfoiled stab can be tricky because there are no straight, flat surfaces to measure against, so I used a trick I learned from Dan Wolanski: install 1/32-inch-ply dummy hinges into the stab. Place a piece of scrap wood on the dummy hinge (aligned with the centerline of the TE), then attach it with glue. Now, you have a flat surface onto which you can place a triangle to set the vertical alignment of the fin.

RADIO INSTALLATION

I installed Futaba* 9402 servos on all of the control surfaces (111 oz.-in. torque). One servo in each wing controls the ailerons, and both halves of the elevator are controlled separately by two servos mounted in the fuselage, under the stab. For the rudder, there are two servos mounted in the tail. I used a 5-cell Cermark* 1700mAh battery and Cermark 22-gauge extensions. To balance my plane properly, I needed to put the battery in the tail (in front of F11). A Futaba 9ZAW transmitter controls the airplane through a Futaba R149DP PCM receiver.

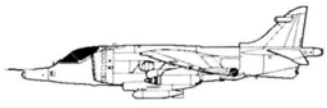
ENGINE

A Brison 6.4 twin-cylinder gas engine powers my plane with a Mejzlik Modellbau 26x12 carbon-fiber prop. The Brison engine is powerful, reliable, durable and easy-handling. With this powerplant, vertical performance is truly unlimited. Vertical maneuvers, including snaps or multiple rolls on uplines, are possible without needing to excessively slow the plane. I installed a CH Electronics* ignition with 1/4-32 spark plugs. By using these plugs, the engine fit entirely within the cowl without cutouts for the spark plugs. A muffler from Bisson Custom Mufflers* quiets the craft and fits nicely in the cowl. A Cermark 1500mAh, 4-cell pack for the ignition and a Revolution Enterprises Inc.* 4.5-inch, bar-stock aluminum spinner completed the package.

COVERING AND PAINT

I used Ultracote* to cover the plane and PPG Deltron Acrylic Urethane (DAU) automotive paint to paint the cowl and wheel pants. If you use DAU, be aware that it is a catalyzed paint that requires careful handling and use of a good respirator. DAU will give you an excellent finish; the gloss you see when the final coat is sprayed is the exact gloss you'll see when the paint dries. It has also been proven very durable on airplanes.

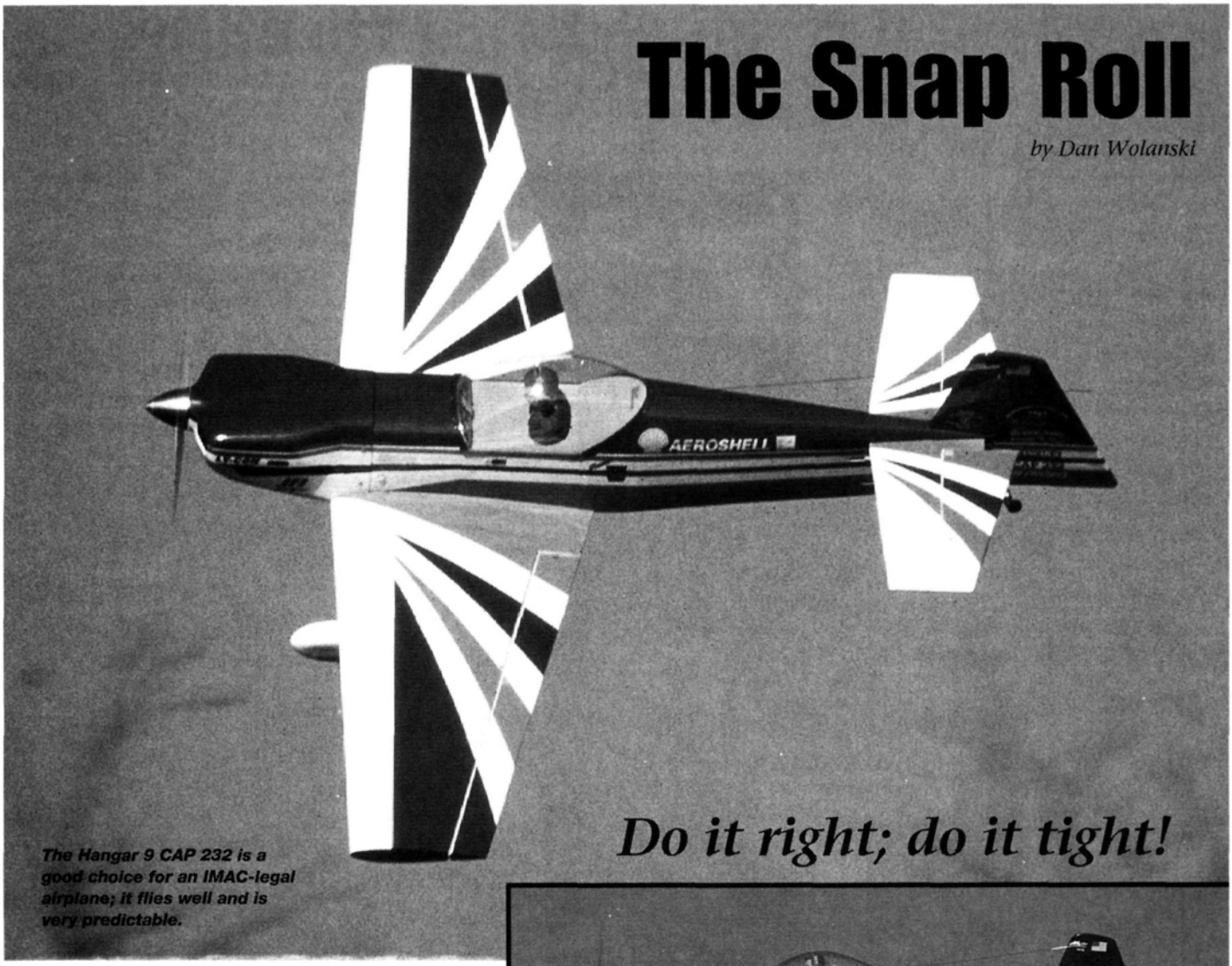
**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*



IMAC Aerobatics

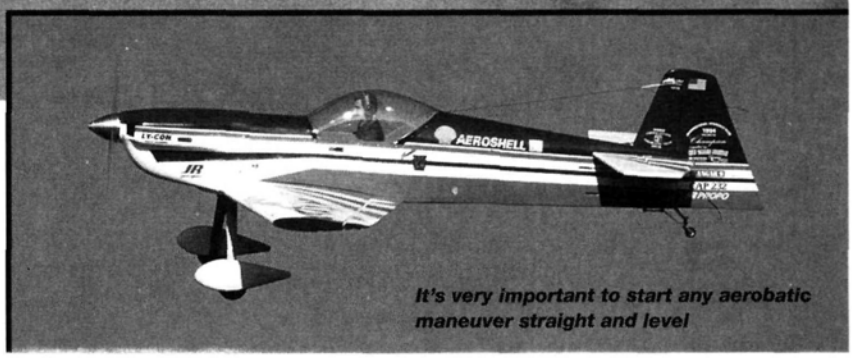
The Snap Roll

by Dan Wolanski



The Hangar 9 CAP 232 is a good choice for an IMAC-legal airplane; it flies well and is very predictable.

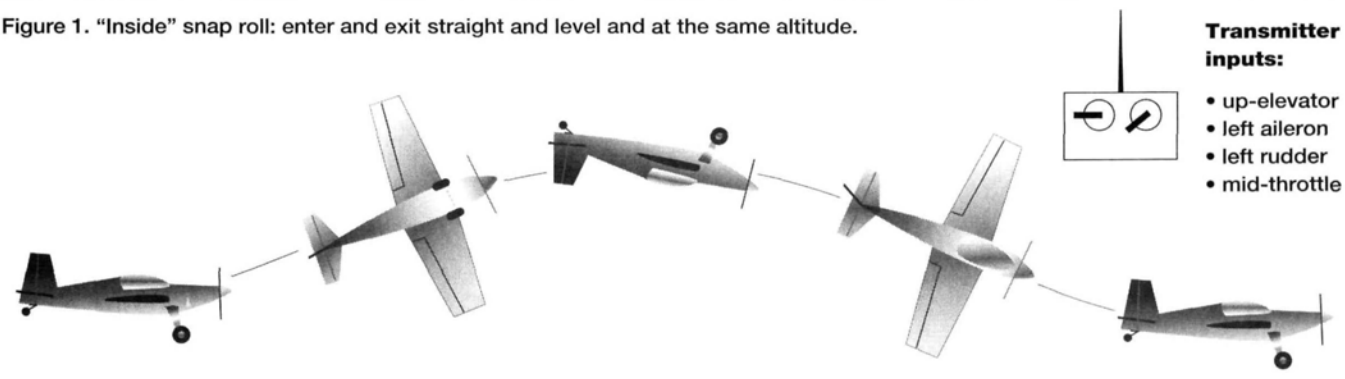
Do it right; do it tight!



It's very important to start any aerobatic maneuver straight and level

THE SNAP ROLL is an advanced maneuver that you'll first encounter in the IMAC Sportsman sequence. It evolves into more difficult variations in the upper classes of competition. It is one of the most difficult maneuvers in which to consistently achieve a high score because it requires a keen sense of timing, throttle management and exit correction. In addition,

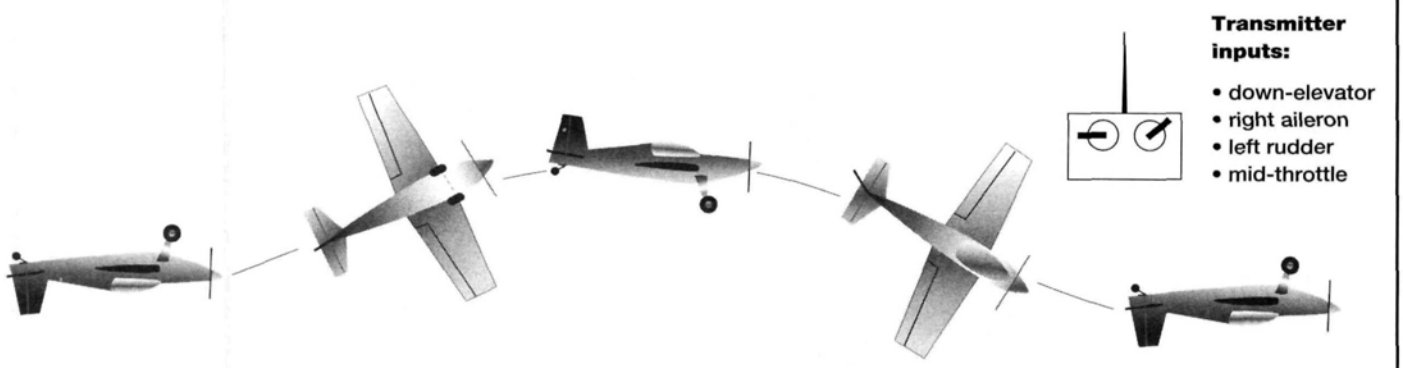
Figure 1. "Inside" snap roll: enter and exit straight and level and at the same altitude.



Transmitter inputs:

- up-elevator
- left aileron
- left rudder
- mid-throttle

Figure 2. Inverted snap roll: enter and exit inverted, straight and level and at the same altitude.



every plane seems to snap differently owing to its CG location and wing placement, i.e., low wing, mid wing, or high wing. If you want to achieve a good snap roll, practice is mandatory.

The snap roll is an autorotation maneuver in a stalled condition. During a snap, one wing is stalled while the other is accelerated about the roll axis. This creates a sudden roll-rate acceleration that you can't obtain by simply inputting aileron. To achieve this condition in a model, several inputs must be given, including elevator, rudder and aileron. Pilots of full-scale planes will scoff at the idea of adding aileron because it is not required when they deal with wing loadings in the range of 35 pounds per square foot. Our models, however, typically carry a wing loading of from 20 to 40 ounces per square foot, so their flight dynamics are different from those of full-scale planes.

FLYING THE MANEUVER

The simplest snap is known as the "inside snap" (see Figure 1). This maneuver is performed from the upright position and is induced by adding elevator, rudder and aileron. Before you try this maneuver, be prepared for your plane to rotate at least twice as fast as it does during a typical aileron roll. You probably won't even see your plane perform the maneuver because it happens so quickly. Instead, you will barely have started your control inputs when you'll immediately have to think about recovery. Make sure that you have enough altitude to allow mistakes!

Now take the airplane to a comfortable altitude at least 100 yards in front of you, parallel to the runway. Enter the aerobatic zone and fly to the center of the box at mid throttle (not full throttle). From level flight, perform an inside left snap by simultaneously applying up-elevator, left rudder and left aileron for 1 to 2 seconds. Recover from the maneuver by neutralizing the sticks and immediately adding right rudder to correct your loss of heading. Maintain the mid-throttle setting throughout the maneuver.

FINESSING THE MANEUVER

There are several places where a little finesse will go a long way. Most pilots bury their sticks in the corners of their transmitters to snap their planes. This typically creates a stall in which too much energy is depleted, and recovery is very difficult. This condition is known as "snapping too deep." Your goal is to fly through the maneuver with enough inertia to allow the airflow to re-attach to the stalled wing on demand. To accomplish this, you will need to decrease the elevator and/or rudder input until your plane just barely snaps. The only way to find this point is to practice it. When you find the perfect combination of elevator, rudder and aileron, practice it over and over until you can easily duplicate it.

SNAP SWITCHES

You may think that the best way to accomplish the perfect snap is to set up a snap switch. I have tried it and prefer not to use a switch. A snap switch is like a crutch; some day, you'll have to learn how to walk without it, so why use it at all? As you advance, you will need to learn how to snap in every direction, including positive and negative snaps. Although computer radios like the Futaba* 9ZAW will handle every snap position imaginable, forgetting to flip the right switch before the maneuver can lead to disaster. I have witnessed this happen to several Tournament of Champions planes with catastrophic results.

VARIATIONS

The most popular variation is the negative snap from inverted flight (see Figure 2). To perform this maneuver, enter the aerobatic zone inverted and fly to the center of the box. Maintain the mid-throttle setting and input down-elevator, left rudder and right aileron (for a right-hand snap). A common mistake is to input left aileron. Remember, when the rudder is inverted, you need to input opposite rudder! Recover by neutralizing the stick and adding left rudder to correct your heading loss. Finesse the negative snap in the same way: by decreasing the elevator and rudder inputs to achieve a perfect maneuver.

If you've ever studied the sequences from the Tournament of Champions, Masters or IMAC Unlimited, you will find several snaps in what may be considered the "wrong" direction, e.g., a negative snap from upright. If you attempt one of these maneuvers using the procedure I have just outlined, your plane may dive violently into a secondary spin. To accomplish a negative snap from upright, input the aileron command a fraction of a second before inputting elevator and rudder. This will roll the plane so that it isn't heading toward the ground when the elevator is initiated. Timing this maneuver is very critical. If you hold the aileron too long before inputting elevator and rudder, you will gain altitude because the plane will have rolled too far. If you input elevator too soon, you may find yourself heading into a spin. This variation is not for the faint of heart; be careful when you practice it. Remember, your goal is to exit the maneuver at the same altitude and with the same heading as you entered it. Don't let the plane determine the exit direction; that's your job! And with this maneuver, it isn't easy. Good luck, and keep practicing!

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by Peter Abbe

WALTER EXTRA COULD NOT possibly have imagined how many variations his full-scale aircraft would inspire. From exact scale to profile versions, Extras remain among the most popular aerobatic models on the market today. The new Sig Mfg.* Somethin' Extra represents a unique interpretation of this design. Blending modern fun-fly performance with a traditional built-up fuselage, Sig has created a model that is aesthetically pleasing and a blast to fly.

Sig Mfg. SOMETHIN' EXTRA

SPECIFICATIONS

Model name: Somethin' Extra
Manufacturer: Sig Mfg. Co.
Type: sport/fun fly
Wingspan: 51.5 in.
Length: 48.25 in.
Wing area: 614 sq. in.
Weight: 5.5 lb.
Wing loading: 20.66 oz./sq. ft.

Prop used: APC 10x6
Airfoil: fully symmetrical
Construction: balsa and ply
Radio req'd: 4-channel w/5 servos
Radio used: Hitec* Focus 4
Engine req'd: .40 to .46 2-stroke, or .56 to .65 4-stroke
Engine used: Rossi .40
List price: $99.95

Features: all laser-cut wood; complete hardware and accessory pack; durable 0.090 hardened-aluminum landing gear; rolled plans; detailed instruction manual; removable wing panels.

Comments: this is a good kit for someone who has some ARF building experience and who wants to step into the realm of kit building.

Hits
- Laser-cut wood.
- Complete hardware and accessory pack.
- Flight performance.
- Exceptional value.

Misses
- Method of wing attachment (see text).



"Sig"nificantly more fun!

OVERVIEW

I was immediately impressed with the neatly packed and organized kit contents. The laser cutting is immaculate, and the quality of all the wood is first rate. The supplied wheel pants, canopy, aluminum landing gear, rolled CAD plans and decal sheet are typical of Sig's high quality. Nearly all the necessary hardware is included: the builder needs only to buy an engine, radio, fuel tank and wheels. The 26-page instruction manual has more than 60 photos and diagrams. With helpful tips throughout, no guesswork is required.

WINGS

The wings are built directly over the plans using typical "pin-to-the-board" construction. Jig tabs on the ribs help to ensure a straight, true wing. The spars are made of ¼-inch balsa sticks and slide into their respective wing slots with no sanding required. The three inboard ribs have laser-cut holes designed to receive the outer phenolic wing tube. It is a good idea to trial-fit this tube in the ribs before gluing the assembly together. I had to sand the inside of these rib cutouts very lightly to obtain a proper fit. Don't overdo it; if you remove too much wood, the wings may not be aligned properly when you attach them to the fuselage later. The fit should be snug but shouldn't bind during installation. The leading edge is preshaped and requires little sanding. The ¼-inch-square balsa trailing edge must be planed and sanded to shape. Take care when installing these edges, as it is very easy to pull the ribs out of alignment. The inboard ribs must be exactly square; otherwise, the wing panels will not be seated properly against the fuselage.

EMPENNAGE AND AILERONS

The tail feathers and ailerons are built up out of all laser-cut pieces. Simply apply a bead of thick CA to the mating edges and assemble them. The laser-cut notches make lining up these pieces almost foolproof. I didn't have to pin these parts to the plans; I simply used the plans as a reference and held the parts flat to the building board, applying accelerator to set everything up. Be sure to sand the hinge lines of the control surfaces to the recommended 45-degree angle; otherwise, control throws will be limited. Use fiberglass to reinforce the precut control-horn holes, elevator joiner and tailwheel assembly, then set them aside.

FUSELAGE AND HATCH

The fuselage is a unique part of the construction. Take your time to carefully line up the balsa fuselage sides and doublers; when this has been done, everything else falls into place. The firewall, formers, servo tray, tank floor and landing-gear plate fall precisely into their respective laser-cut slots. The upper and lower decks are notched to mate with the fuselage sides, and this makes it nearly impossible to build things out of alignment. The turtle-deck formers fit into precut slots, and the stringers line up straight and true.

The hatch is constructed of a lite-ply base and sheeted balsa formers. It is attached to the fuselage with a dowel and a nylon bolt and provides the necessary access to all radio gear, fuel tank and wing-attachment bolts. At this time, trim and test-fit the canopy in place. I tinted my canopy with dark blue Rit dye by submerging it in 2 gallons of hot water and a single package of Rit. The longer you leave the canopy in the dye, the darker the tint will become.

FINAL ASSEMBLY

Trial-fit and sand all the subassemblies. The wing slides onto an aluminum tube and is keyed up by a single dowel near the trailing edge. It is then held in place with a single no. 64 rubber band wrapped around a pair of J-hooks screwed into the inboard ribs. Make sure the J-hooks do not have any nicks or burrs that might damage the rubber band; a lot is riding on the integrity of this single rubber band, so I backed it up by adding another one. Although I have had no trouble with this method of attachment, I would have preferred a more secure design.

I glued the two-piece wheel pants together and painted them with 21st Century* paint. I covered and trimmed my Extra using Carl Goldberg Models* Ultracote. To achieve the best results, be sure to use the wet application method when you apply decals. Although the manual suggests installing the fin and stab before covering, I found it much easier to simply cover the parts individually, remove the covering where wood meets wood and then glue these parts into place. I opted to omit reinforcing the tail surfaces with pushrod wire as recommended; this merely adds unnecessary weight to the tail of the model. If, however, you feel more comfortable with this added rigging, all the hardware needed to do the job is provided.

I was able to quickly install the servos using the provided trays. I balanced the model, double-checked everything and was ready to go.

FINAL THOUGHTS

The Sig Somethin' Extra is an excellent example of modern-day model engineering. It is a fine kit for anyone with limited building experience, or someone who is looking to break away from

PHOTOS BY GUY DANELLA



FLIGHT PERFORMANCE

I balanced the Extra according to the plans and then carefully balanced it laterally (don't skip this step). I do not like using dual rates, so I set the control throws halfway between the recommended high- and low-rate settings. This turned out to be optimal for my preferences. With the Rossi* .40 running strong, I was ready to go.

• TAKEOFF AND LANDING

I quickly advanced the throttle to full, and the Extra sped down the runway; it required only minimal rudder correction to keep it in a straight line. I slowly began feeding in up-elevator, and the model pitched up abruptly as soon as flying speed was achieved. I pushed the nose down and brought the plane into the pattern. To my surprise, no trim changes were required, and I immediately became very comfortable with the model.

My first landing was deadstick, and because the plane has a light wing loading, it glided in better than most trainers. Subsequent power on landings proved to be just as easy and needed only a touch of right rudder to keep the model lined up with the runway. The thick airfoil slows things down nicely and handles the wind with ease. To avoid bouncing down the strip, the Extra should be landed in a full-stall, 3-point attitude. If you fly off a grass field, you may need to remove the wheel pants, as they tend to get hung up in the grass and prevent the model from achieving the necessary takeoff speed.

• HIGH-SPEED FLIGHT

The Extra moves out at a good clip, tracking straight and true with no sign of flutter. It is a very clean design, but its thick airfoil limits maximum airspeed. It simply wasn't designed for all-out speed.

• LOW-SPEED FLIGHT

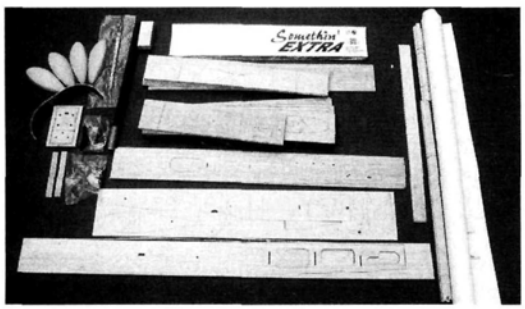
The Extra flies as slowly as any trainer because of its light weight and low wing loading. It's possible to keep the Extra airborne with the engine running just above idle. Its huge control surfaces remain effective down to zero airspeed. When stalls occur, the nose simply drops with no tendency to tip-stall. The wing starts flying as soon as elevator backpressure is released.

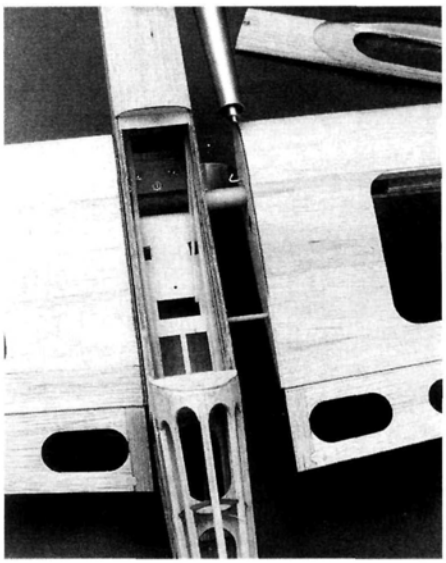
• AEROBATICS

The Extra was born to perform any maneuver its pilot is capable of. Rolls were fast and axial; loops were very tight at full elevator deflection and required minimal rudder correction. Inverted flight requires only a touch of down-elevator. Stall turns were very nice; snap rolls and spins were downright insane. Simply release the sticks, and the Extra stops its gyrations immediately.

The Rossi .40 is a strong engine, but I found myself in need of still more power to bring out the full potential of this airplane. Knife-edge was good and showed no sign of pitch-and-roll coupling, but the Rossi did not have the power to climb in knife-edge flight. I found myself increasing the rudder throw to maximum possible deflection, and still, I wanted more.

If you want to experience the plane's full capabilities, put a strong engine in the nose.

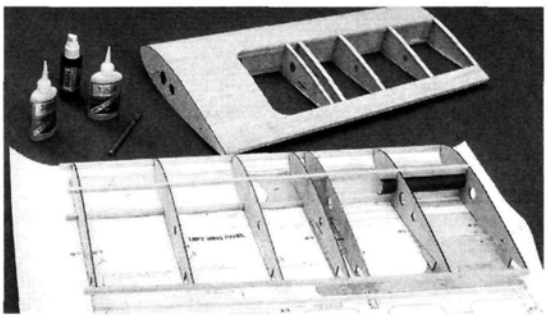




Left: the kit contains laser-cut wood, neatly packaged hardware, accessories and rolled plans. Right: the wing slides onto an aluminum tube and is keyed to an 1/8-inch dowel. Both panels are then held to the fuse by wrapping a no. 64 rubber band around two inboard J-hooks. Below: the wing is built directly over the plans. A phenolic tube is built into each wing panel along with the laser-cut servo mounts.

"cookie-cutter" ARFs. Because of its ability to perform extreme maneuvers, this isn't a model for beginners. The pilot should have at least some experience with an intermediate aerobatic trainer. Its flight performance is outstanding, and the kit is an exceptional value. If you build the Somethin' Extra, don't under-power it. A strong .46 is a necessity, and a Webra* Speed .50 would really make it sing. If you opt for a large 4-stroke, you will need to use larger wheels to obtain the necessary ground clearance for the prop.

Sig's skilled use of CNC laser-cutting technology, high-quality hardware and accessories has yielded a kit that is a pleasure to build and goes together as fast as most ARFs currently available. Featuring a two-piece wing, the Somethin' Extra can be broken down quickly for easy transportation and storage. Every aspect illustrates Sig's attention to detail. The Somethin' Extra is a great kit and the best aerobatic flier I have owned. If you're looking for that somethin' extra to add to your hangar, check out the Somethin' Extra; you won't be disappointed!





The Extra all assembled and ready for final sanding and covering. A sharp-looking framework!

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.* ✈

MODEL AIRPLANE NEWS
HOW TO

Convert a Rubber-Powered Free-Flight to Electric R/C

The Dumas 30-inch Bearcat is a great choice

by Tom Hunt





PHOTOS BY ROB ARRIEL & TOM HUNT

SINCE I STARTED flying R/C models in the '70s, the size of receivers, servos and other hardware (except transmitters!) has been slowly decreasing. Now, with true "nano" stuff available, R/C model aircraft will soon be kept in shoeboxes in the closet and flown in living rooms! Well, the subject of this article is not quite that small, but it's close!

After spending a few years keeping my eyes and ears open for glow models that I could convert to electric power, I took a break and started a new quest: rubber to electric conversions. At the last Toledo show, I picked up the new, 30-inch-span, rubber-powered Dumas* F8F Bearcat. It appeared as though it would be a relatively easy task to convert this model to electric R/C flight. I decided to give the Bearcat aileron/elevator control because I wanted to keep the dihedral more scale-like. (The model would have needed quite a bit more dihedral to turn properly with rudder, although in hindsight, the model could have supported the extra ½ to ¾ ounce that rudder control would have added.) As long as the Bearcat weighed less than 12 ounces, I wanted to power it with the GD-280 (Titanic Airlines/Graupner Speed 280 motor/gearbox combo imported by Modelair-Tech*).

I don't intend to make this a blow-by-blow, stick-by-stick construction article. I will, however, describe my modifications to make this a fine flying, R/C electric aircraft. I intended to use as many parts as possible from the basic kit—even some of the scrap wood from the laser-cut sheets!



OTHER CONVERSION IDEAS

Here's a short list of some of the other scale models I think might be suitable for the Titanic Airlines GD-280 power system and micro R/C equipment described here.

Guillows 3/4-inch scale P-47 Thunderbolt
Guillows 3/4-inch-scale F6F Hellcat
Guillows 3/4-inch-scale F4U Corsair
Guillows 3/4-inch-scale SBD-3 Dauntless
Guillows Cessna 172 Skyhawk
Herr (36-inch) J-3
Herr Ryan ST
Herr Fairchild 24
Herr Pitts Special
Dumas Helldiver
Dumas 30-inch Mr. Mulligan
Hacker Tigermoth

Any other model you can think of that has a wing area of between 150 and 225 square inches should be fine. If you're not into scale, many old-timer, rubber-power, free-flight models and Wakefields might also be appropriate.

THE BASIC KIT

The kit is quite complete and comes with laser-cut parts, stripwood, Insignia Blue tissue, dry-transfer decals, vacuum-formed canopy and cowl, wheels, rubber, prop, wire and some miscellaneous hardware. Only glue and dope are needed to build and fly the model as intended. The instructions and plans are clear and well thought out. The laser-cut parts can be removed from the sheet by slicing through two to three tabs per part. Use the plans to identify them first, as no printing is on the wood. Much of the stripwood (the stringers) is very soft. This might be a desirable attribute for an extremely light, rubber-power model, but for a heavier R/C model, it's quite a nuisance because it's easily broken during handling. I suggest that you weed out the softer sticks and replace them with some of a harder grade.

THE MODIFICATIONS

• **The wing.** I hate building wings, so I built this first, just to get it out of the way. The wing is built in three sections: the outer panels and a flat center section. I scanned the outer wing section into my computer and drew in an aileron. Slightly larger than scale, the proportions still looked good. The outer ribs would have to be cut back and a sub spar installed just ahead of the aileron hinge line. The aileron itself still uses the remainder of the ribs; however, I duplicated an aft portion of R5 for the inboard side of the aileron. I like top-hinged devices. They're easy to make and install and are completely sealed, so they're very effective. I pinned the leading-edge sheet of the aileron to the board at a slight angle to provide the gap for the down-aileron travel.

I built the remainder of the wing stock. After I had joined the three sections, I added 1/32, vertical grain, balsa shear webs to the main spar out to the inboard side of the aileron. I didn't make a dihedral brace because the covering material was going to add more strength to the wing than was probably required for the flight loads. I made aileron torque rods out of 1/32 piano wire and 1/16 aluminum tube and installed them in the top of the wing before covering it. At first, it did appear that this light gauge wire (used to keep the weight down) was a bit flimsy. I had some concerns about flutter, but it never materialized. If you can find a suitable tube, you could increase the wire size to .040 or .055 if you'd like. The extra weight should not be a problem.

I used an FMA* S-60 servo for aileron and mounted it very typically on a pair of rails supported across the center-section ribs. Using some of the tube that's used to run the torque rod out to the aileron, I flattened the end of about a 3/4-inch-long piece and drilled a 1/32-inch-diameter hole through the flattened end. I then glued this piece to the 1/32 wire torque rod with thick CA, then installed simple, solid, 1/32-inch-diameter wire pushrods with Z-bends at each end and a mid-span V-bend (for adjustment).

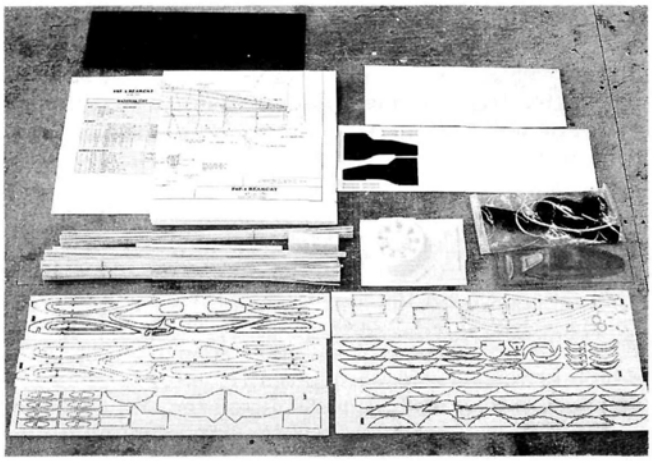
AT THE FIELD

On a calm spring morning, around sunrise, I checked the controls and the CG one last time. I tossed the model firmly into the air, with the nose only slightly elevated. To my surprise, it not only continued to climb, but its climb also became steeper! It climbed to about 150 feet, then I throttled back. I was quite pleased with the speed of this fat little warbird. After inputting some slight down-elevator trim, I began to wring out the little model. It looped tightly with speed but would snap roll out if it entered the loop too slowly. It rolled just like a fighter should: a little off axial. Stall turns (to the left) are easy, even without a rudder. Because it's light and spins a larger prop, the model naturally pulls to the left at the top of the maneuver. Inverted flight requires quite a bit of down-elevator, but some travel is left; the thick, nearly flat-bottom wing is responsible for that. The model stalls with a wing drop (either way), but because of the low wing loading, recovery is quick. Without rudder, I could not do any spins, but the wing-drop stalls do not accelerate into spins if left unattended. The first flight lasted about 4 minutes—not bad on 150mAh cells!

Next time out, I tried a 7-cell, 350mAh pack. The model's weight increased to about 11.3 ounces. I certainly expected the flights to be longer—maybe twice as long—because of the higher capacity (and the lower current), but I was not sure what the extra weight would do to the model. This flight did seem a bit sluggish. I felt, though, that I had to stay at a higher throttle setting to keep the model moving. Flight time was barely over 6 minutes. Was the weight too much, or was the power too low?

On the third flight, I added an eighth cell to the 350mAh pack and cycled it a few times to make sure that all the cells were balanced. The model now weighed 11.6 ounces. Another sunrise session showed that not only was the power back, but also that the increased weight did not adversely affect the flight performance. In fact, the flight lasted an astounding 7 1/2 minutes with a lot of aerobatics and high-speed passes thrown in.

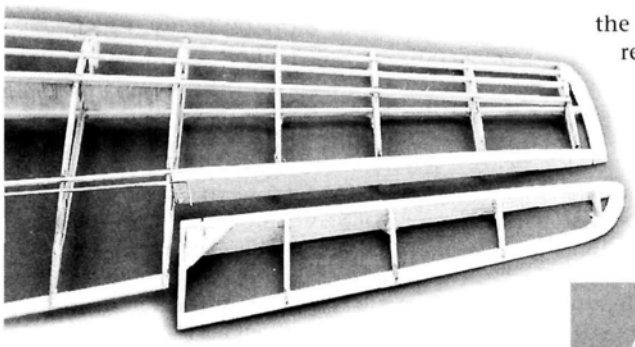
I generally fly the Bearcat with the 8-cell, 150 pack when the winds are light. When the winds pick up, I throw in the 8-cell, 350 pack to help the model better penetrate the wind. The model is quite stable and fun to fly. It can be slowed down quite nicely for landings. I do recommend, though, only nice, soft grass for belly-whopping. I would not call this a park flier; you need a bit more space than a big backyard or a small, tree-lined ball field to fly in. The Bearcat can be kept close by the experienced pilot in a limited area. Despite its big radial cowl, the model does not slow down that quickly with the power off. Leave yourself a lot of room to land the first few times. My concerns during construction and installation of the soft aileron torque rod never became an issue. Control-surface flutter usually is present in soft, "sloppy" installations; however, at the speed at which the model flies, the very low mass of the aileron does not cause any flutter—even in power-on dives from a split-S. Blow-back could be another problem. This is when the aerodynamic load on the surface is so high that the servo cannot push the device into the flow to provide control. Again, I didn't experience this at the speeds this model is capable of flying. I certainly would not expect this to be the case if you "over-powered" this model with a direct-drive 400 motor, though!



All the parts that come in the basic kit.

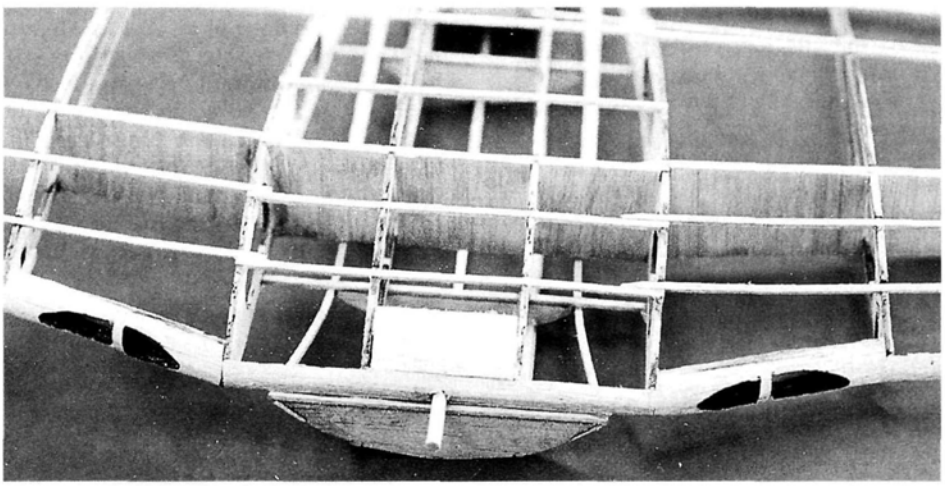
• **Fuselage**. What a monster! You could get three or four complete micro radio systems in this fuselage! After building the fuselage per the instructions, I added some 1/32 sheet wood to the inside on which to mount the equipment. I also added some sheet wood to the fuselage sidewall, inside the stringers just aft of the trailing edge (TE) of the wing, to provide a tougher grip area for hand launching. I also framed the section around the cowl as if the cowl were going to be removable (like the rubber versions). I mounted the Titanic Airlines GD-280 motor/gearbox on a plate fastened to the frame around the cowl. I also added some braces as required for this assembly. I decided to retain the cowl/drive with a pair of small rubber bands looped around metal hooks fastened to the cowl, with the opposite end secured to a pair of wooden "hooks" glued to the inside wall of the fuselage, near the wing's leading edge (LE). This arrangement works great! I can access the motor/gearbox by just pulling the cowl forward or by removing the rubber bands. This "soft" mount will also reduce damage to the drive in the event of an accident.

I mounted the wing to the fuselage in much the same manner. A hook on a deck just below the canopy holds one end of the rubber band, and the other end is attached to a hook that's glued into a balsa block in the wing's TE. I strengthened the bulkhead at the wing LE with some sheet wood and made a hole for the 1/8-inch-diameter LE dowel. To install the wing, I simply attach the rubber band to each hook, pull the wing aft enough to slip the LE dowel into the hole and let go! It's simple, effective and shock-absorbent, too! You may need to try a few different rubber bands to get the right tension. I used one double-looped no. 64 on the wing. The cowl is



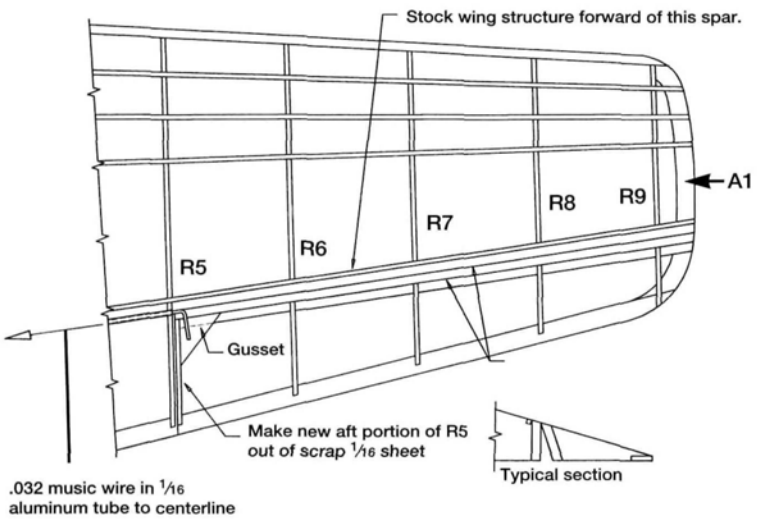
Outer wing panel showing the installation of an aileron.

• **Empennage**. I built the vertical tail stock. As mentioned earlier, no rudder was used. Both the free-flight and scale horizontal tails are shown on the plan; I compromised and built one somewhere in between using the available laser-cut parts and the hardest 1/8-inch-square balsa I could find in the kit. After I had designed and built scale-size elevator, I made a joiner between the two elevators out of some 0.055 wire that was in the kit. A piece of 1/8-inch dowel with a 1/32 hole drilled through the end functions as the control horn.

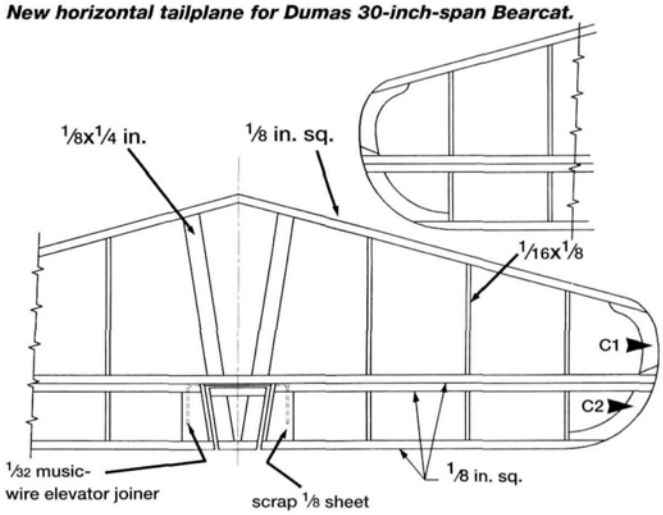


A balsa block is added to the LE to support the wing pin dowel (1/8 hardwood). Note the 1/32 sheet, vertical-grain shear webs.

Aileron modifications to Dumas 30-inch Bearcat.

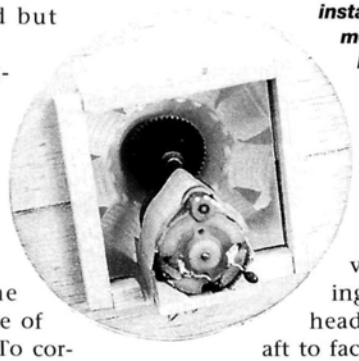


New horizontal tailplane for Dumas 30-inch-span Bearcat.



retained by two bands of similar length, double looped but narrower.

After I had shrink-wrapped the elevator servo (an FMA S-60), I simply glued it to the inside sidewall of the model with 5-minute epoxy. The receiver (an FMA Tetra) was installed about mid-wing in the fuselage on a small piece of hook-and-loop fastener. To correctly balance the model, I had to put the battery pack just behind the LE bulkhead. A simple 1/32 wire pushrod attaches the servo to the elevator horn. Again, as I did with the ailerons, I made a mid-span V-bend in the wire for last-minute adjustments. I allowed the ESC (an FMA SC-5) to hang loose inside the fuselage. To keep the weight down, I used 4-pin Deans* connectors (two pins for +, two pins for -). Current is only about 3 to 3.5 amps in most cases, and the "doubled-up" Deans connector works well at this level.



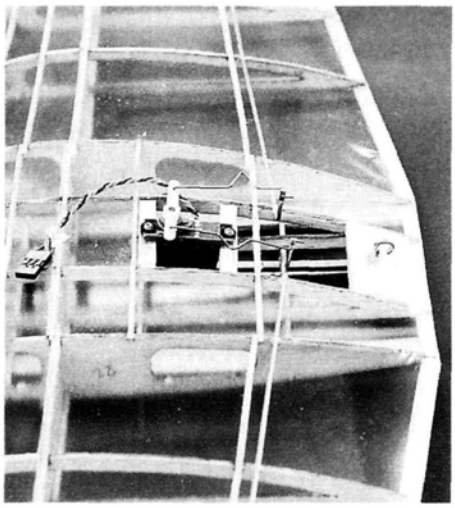
Titanic Airlines GD-280 motor/ gearbox installed in a vacuum-formed cowl mount; note that additional bracing was done later to stiffen the mount.

FINAL ASSEMBLY

I built the lower part of the fuselage (below the wing) as per instructions, then added miscellaneous sticks to toughen up this area (because it's a belly-whopper!) and to help provide more area for the covering to adhere to. The LE bulkhead should be angled slightly aft to facilitate installing and removing the wing.

I covered the Bearcat in Clearfilm*. This relatively light and durable iron-on Mylar is primarily used to laminate documents. It only comes in clear, but it is nearly a third of the weight of most hobby-covering materials. It works at high temperatures, shrinks less than most model brands (a good thing for frail structures) and can be painted on the outside or inside! If painted on the inside (before covering), you must use a fast-drying enamel or acrylic paint so you don't affect its adhesion to the wood or itself. If you paint it on the outside, you only need to clean any latent finger oil off the surface with alcohol.

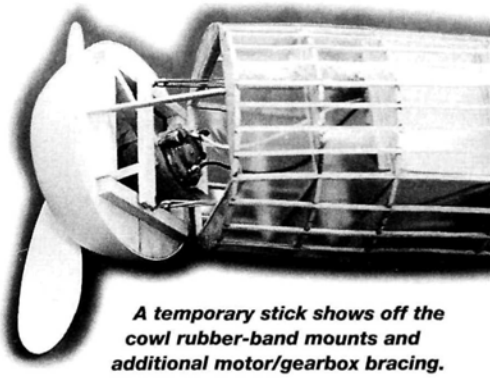
After I covered the entire model, I cleaned it and painted it with two light coats of Top Flite* Insignia Blue LustreKote. If you need to mask sections and add a second color, you may need a base coat of primer. This paint sticks well enough to be handled, but if it is not primed first, pulling off the tape may remove the primary color. I applied the supplied decals a day after painting the model.



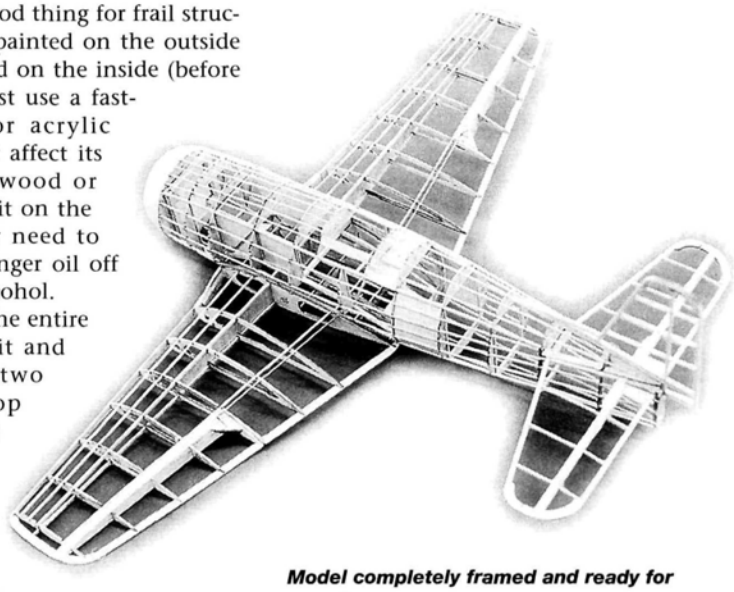
An FMA S-60 aileron servo is installed in the wing center section. Note the hook that has been installed in the TE block for the wing rubber-band retention scheme.

THE FINISHED MODEL

The Bearcat, with a complement of 8, 150mAh cells,weighed in at 10.4 ounces ready to fly. I chose this capacity/cell count as a good compromise between weight and duration for the first flight. The wing area computes to just about 170 square inches, yielding a wing loading of a mere 8.5 ounces per square foot! I have sailplanes with higher wing loadings than that! On the 8-cell pack, the GD-280 spins the supplied 7x6 prop at about 5,000rpm for just about 3.25 amps. That's 26 watts of input power, and a 40 watts-per-pound power loading—actually quite respectable!



A temporary stick shows off the cowl rubber-band mounts and additional motor/gearbox bracing.

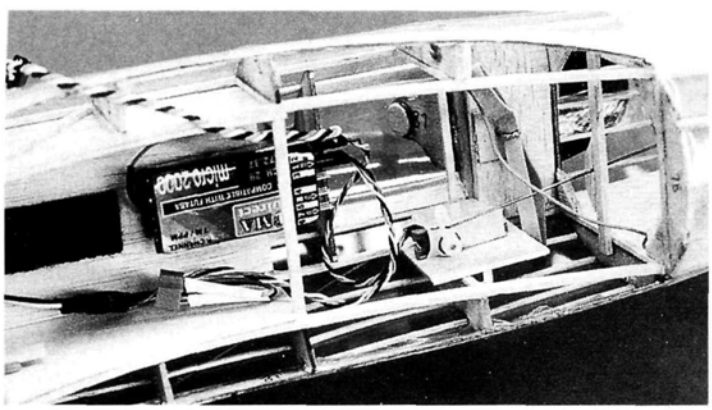


Model completely framed and ready for covering.

The project was a wonderful success. I have taken the Bearcat to all the E-meets I attend here in the Northeast, and it always draws a crowd. It's nice to see that the world of rubber models now has the potential to be converted to electric-power, R/C flight. It appears that only common sense "strengthening" would be required for any of them.

If you have any questions about this or any other electric model project, I can be reached c/o *Model Airplane News*. 100 East Ridge, Ridgefield, CT 06877, or by email at man@airage.com.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

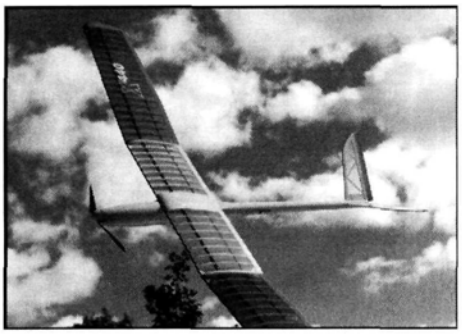


Equipment installation. Note the rubber band that's loose in the fuselage under the cockpit. The FMA micro Fortress receiver shown here was later swapped for the smaller and lighter FMA Tetra. The 8-cell 150mAh pack is in front of the receiver. The little black "blob" below the battery is the ESC!

When was the last time you were sorry you bought the best?

You probably know SR Batteries for our receiver, transmitter, and electric flight battery packs. In all phases of the R/C Hobby they are accepted as being the best. However, you probably didn't know that SR is now producing some of the finest ARF and MicroLaser™ Cut kits in the Hobby. Not only that, but we're also publishing a library of modeling information that just isn't available anywhere else.

The X440...



If you've seen one of our X440 kits, we really don't have to say much more. The X440 is as good as they come in construction and ease of building and flying. It has a 65" span and 442 square inches of wing area. It weighs 23 ounces for a wing loading of 7.5 ounces per square foot, ready to fly. The aspect ratio is 9.4:1 and it uses Speed 400 power and an optimized S3021 airfoil.

The X440 comes just the way you see it. You'll be ready to head for the field in less than an hour. We also have prop to battery pack power systems available specifically for the X440. Visit our web site for full details.

The X610...

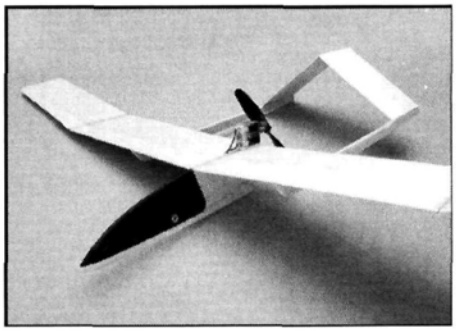


The new SR X610 is an 86" span, almost ready to fly, 49 ounce thermal/duration electric sailplane with a wing area of 610 square inches. The wing loading is only 11.6 ounces per square foot and the aspect ratio is 12:1 for outstanding thermalling ability and wind penetration.The airfoil used is an optimized S3021.

The X610 comes just the way you see it. All you have to do is install your propulsion and radio systems. It can be flown with just aileron and elevator control, but we suggest using rudder too for optimum control.

We have prop to battery pack power systems available specifically for the X610. Visit our web site for full details.

The X70 Micro Electric...



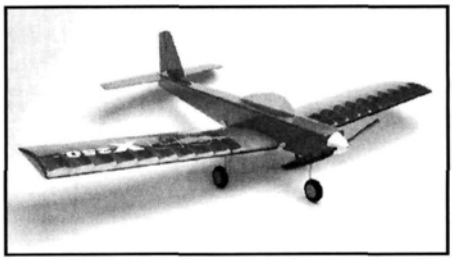
The X70 is a 26" span, 70 square inch hand toss or electric powered Free Flight aircraft that weighs only 1.3 ounces ready to fly!

The X70 is an SR MicroLaser™ Cut kit. The balsa is triple selected and it only takes about an hour of building to get the X70 flying.

The X70 kit is only $9.95 plus $3.50 postage and handling and that includes a copy of *Electric Flight Techniques* volume E-26 on Micro Electric Flight.

In addition, we have a power system for the X70 consisting of a Micro 4 motor, two 3.5x3.5 props, charging jack, charging plug, wire, and a two cell SR 50 Series battery pack for only $20 additional if you purchase it at the same time as an X70 kit.

The X250...



The X250 is a 36" span, 250 square inch Speed 400 sport aircraft. It weighs less than 20 ounces ready to fly. Full throttle flights are 7 minutes and partial throttle flights are well over 10 minutes.

The X250 is an SR MicroLaser™ Cut kit and you can have an X250 ready to fly in only a week of evenings. An optimized prop to battery pack power system is available separately. Visit our web site for full details.

SR's Techniques Library...

R/C Techniques and *Electric Flight Techniques* are published by SR Batteries. Each volume is only $3 including postage. Here's a partial list of what's available:

R/C Techniques

- Rx/Tx battery pack charging
- The tricks to perfect soldering
- Large aircraft wiring
- R/C aircraft design
- Covering techniques
- Learning to fly R/C

Electric Flight Techniques

- Battery pack charging
- Motor wiring systems
- Motor timing
- Motor break-in
- Speed controls
- Electric props
- Speed 400 systems
- Electric conversions
- Motor mounting techniques
- Multi motor systems

For a full *Techniques* index and complete kit details, please call or write us, or visit our web site,

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Tower .46 BB ABC—a powerful bargain!

Everything is so expensive these days; that's why I love it when I can bring you guys a product that really represents good, overall value. That's the case with the Tower Hobbies* .46. A few of my flying buddies, including the venerable Vic Olivett, have been running these engines every weekend, and they are all very happy with them—so I thought I should pass the good news on to you.

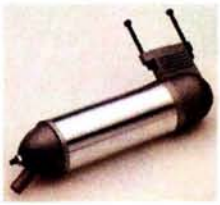
The general consensus of these guys concerning the Tower .46 is that it is a user-friendly engine that performs very well in many respects, including power. The figures in the rpm chart bear this out. Starting is also excellent. Right out of the box, the engine started on the second flip. Throughout testing, the engine continued to start on the first or second flip every time. Its low idle is reliable, and throttle transitions from low idle to high throttle were quick and smooth. Response is excellent; no hesitation at all. But wait! Here's the best part! The engine costs only $75 to $80, with muffler!

The .46 joins the Tower .40, but it has more high-end features than its smaller stablemate. These features include twin, ball-bearing-supported crankshaft; true chrome ABC piston/sleeve technology; twin-needle carburetor (as opposed to air bleed for the Tower .40); remote main needle-valve location for safety and Schnuerle porting.

One of the things I like best about this engine is that it's assembled using Allen socket-head screws. Budget engines often use cheaper Phillips-head screws to hold them together, and this is far less desirable, in my opinion. Oh, yes; the .46 also comes with a two-year warranty. The one criticism that I have is that the Allen wrenches that came with the engine are very low quality. They stripped out quickly, and I recommend that you toss them. Use your own, high-quality wrenches instead.



The large-volume expansion-chamber muffler has no internal baffles but still does an acceptable job of silencing.





More and more engines are being supplied with rear-mounted main needle-valve assemblies; a far safer location than on the carburetor body. From the exhaust side, the low-end mixture screw can be seen on the throttle barrel.

Though we have run these engines for only a few weeks, as of this writing, the .46 should prove to do well in the longevity department too, because it has chrome plating on the cylinder liner instead of nickel, which has gained popularity with some engine manufacturers. Having run this inexpensive powerhouse, I hope Tower now plans to bring us more engines in larger sizes with the same features, performance and awesome pricing as the Tower .46 BB ABC. I'm sure no one will argue when I say that we all love a powerful bargain!

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*



The crankcase back plate features an O-ring seal as opposed to a paper gasket.



The Tower .46 features true chrome, ABC piston and sleeve technology. The conrod is bronze-bushed at both ends and features one oil hole at the wristpin end and two at the crankpin end. The piston has an oil groove, and the wristpin is held in it with Teflon pads that—strangely enough—don't contact the cylinder-sleeve surface, but instead are held in the piston by being snapped into a groove, much like an E-clip.

All tests were done with a stock muffler and under the following conditions:
Temperature: 76 degrees F.
Humidity: 22 percent
Elevation: 255 feet above sea level
Fuel used: 10 percent nitro, 18 percent oil (synthetic/castor mix)
Plug used: Hangar 9* no. 2 performance plug
Prop used: APC*
Tach used: TNC*

Prop	Top-end rpm	Idle rpm	Static thrust (lb.)
10x6	14,220	2,230	7.3
10x7	13,500	2,040	5.8
10x8	12,840	2,240	5.4
11x5	12,820	2,210	7.2
11x6	11,800	2,220	5.8
11x7	11,720	2,040	4.8
12x4	12,960	2,040	8.4
12x6	10,400	1,860	6.2



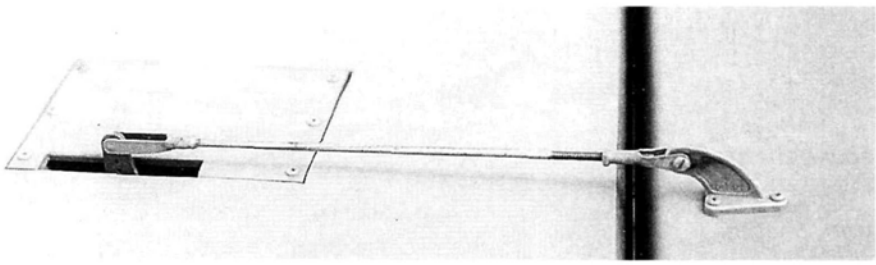
 by Greg Hahn

Commonsense control linkages

WHEN LEAFING through my notes of frequently asked questions, I came across one that I get hit with all the time and thought that it might make a good subject for a column. Of course, I always seem to find controversial subjects, and—as usual—my way of doing things isn't always the norm!

The issue in question concerns servos and linkages: how you go about operating the many surfaces and control functions of today's giant-scale aircraft. As far as I know, there aren't any published rules of thumb on just what to do and how to do it, so I'll throw my standard setup opinions, equipment and procedures into the fiery depths of public scrutiny and maybe come up with some good rules to go by.

In the late '70s, Nick Ziroli and a handful of other visionaries pioneered the idea that model aviation could involve more than small "toy" airplanes. Now, giant-scale airplanes, contrary to their humble beginnings, are adorned with everything that technology has to offer, from computer radios and onboard telemetry to high-horsepower, finely tuned gasoline engines. Yet even with all this techno stuff to the forefront, the all-important control linkages are still in question, and most of the available hardware is still a scaled-up version of a standard 40 to 60 linkage. A few companies, such as Robart*, Du-Bro* and Nelson Hobby Supplies*, produce hardware specifically for giant scale, but there are many questions on how to make everything work reliably and, above all, be strong enough for the job.



Good aileron linkage: the servo is attached to a plywood plate, and the servo arm extends through the surface. It's connected to the aileron with a 4-40 rod and a Robart horn. This short, sweet setup has good leverage, and it's easy to keep an eye on it.

SHORT PHYSICS LESSON

Most full-scale aircraft have balanced control surfaces that, in level flight, compensate for gravity's pull on them. To achieve this balance, the surface usually has some type of weight and arm attached to it or somewhere in its linkage system.

The advantages of having a balanced surface are:

- Less force is needed to physically move the surface (easier on the servo).
- The surface resists inadvertent movement or instability, i.e., there's no chance of aerodynamic flutter. Unfortunately, at best, balancing our models' surfaces isn't easy, and it's often quite impossible, owing mainly to the large amount of throw used by most builders—including me! We rely on our servos and linkage systems to compensate for an out-of-balance situation and to be strong enough to absorb the sometimes enormous stresses to which we subject them. Keep in mind that when the airframe is stressed, the surface link is stressed even more.

BACK TO BASICS

Knowing your piloting skills and understanding the capabilities of your airframe can go a long way toward putting you in the ballpark as far as learning which equipment you need. Because of the lack of useful test data on components, most of us lean toward overkill. This is definitely adequate, but it can also be ugly and expensive. I assess the linkage needs of airframes keeping these four buzzwords in mind:

—short;
—simple;
—tight;
—leverage.

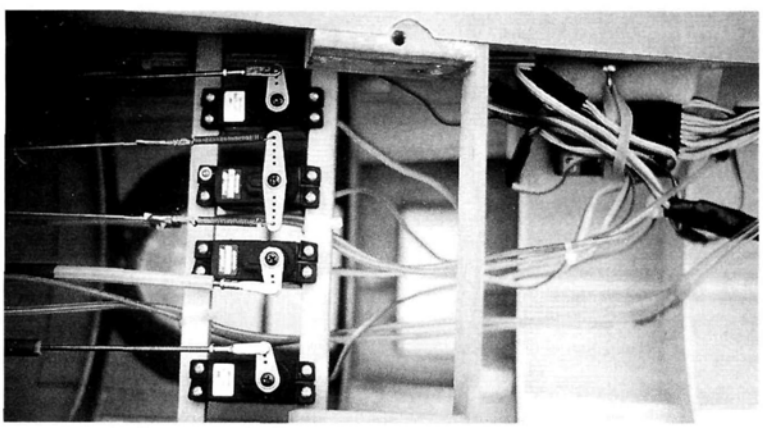
- **Short**. I mean as short as possible. The longer the rod, the more flexing there will be in the system and, therefore, the greater the likelihood of slop.

- **Simple**. This defines itself. Stay away from bellcranks and multiple rod links. Whenever you have to make a connection, you create slop. There has to be clearance between the drive pins in the clevis and the horn, and they can add up to a lot of play.

- **Tight**. If you took care of the first two items on my list, then you have "tight" taken care of except for the servo. Use good, tight servos that have dual ball bearings and preferably a good solid gear mesh. If the servo is sloppy out of the box, it will only get worse—usually, in a very short time.

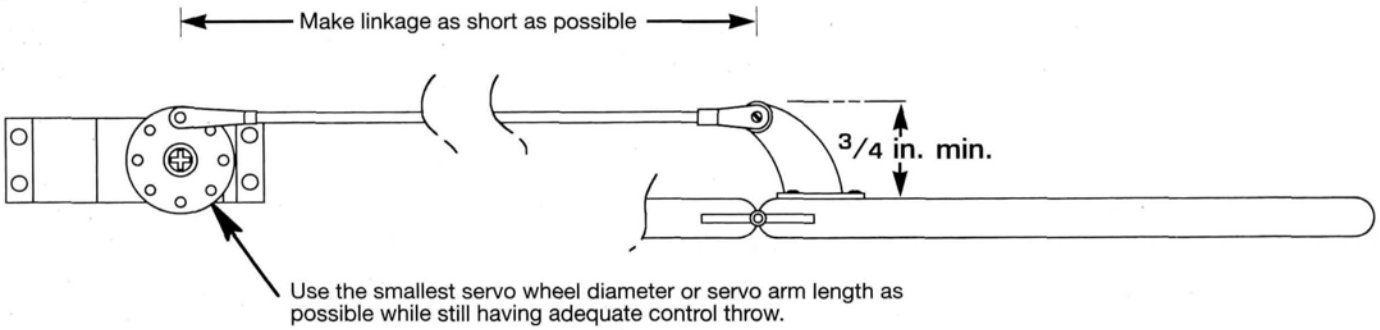
- **Leverage**. Having proper leverage is very important—almost a subject in itself. It can also be hard to come by—especially if you build for scale competition and want to hide all of the pushrods. It's easy to get stuck within the confines of a cramped fuselage tail section or an outer wing panel where there isn't much room for a long control horn.

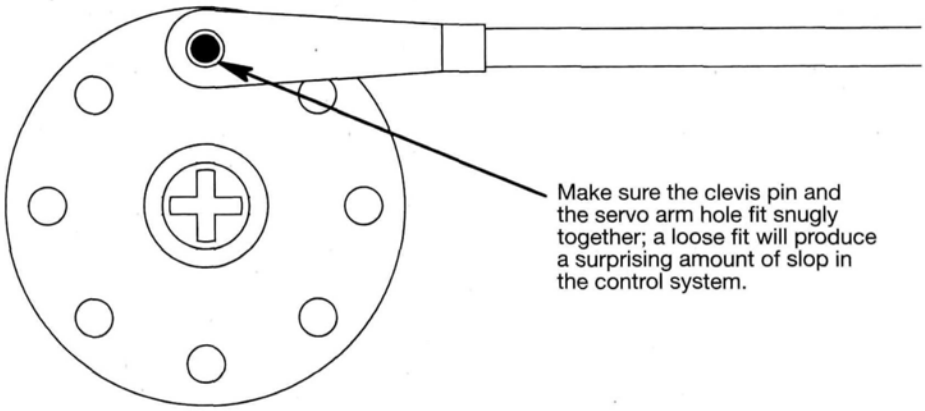
Short control horns provide little leverage and can lead to flutter and undue wear and tear on the system. This makes the servo work harder and puts it under load more often; this is also a big current drain on the battery. The rule for servo arms is exactly opposite that for control horns: farther out on the arm means less power. Here's a good rule to follow: couple a short servo arm with a long surface horn. This will provide maximum servo power and adequate leverage on the surface.



The linkage setup in the fuselage: everything is neat and in order. The rudder and tailwheel servos are in the center, and the elevator servos are on the outside. Note the springs on the tailwheel-servo arms; they relieve the servo of stress and side loads.

Control linkage for giant-scale models





NUTS AND BOLTS

Most of the available "giant" hardware will do a fine job if used properly, but because I'm asked so often, I'll pass along my preferences. The pieces I mention are the ones I use in every project and have had good luck with over the years.

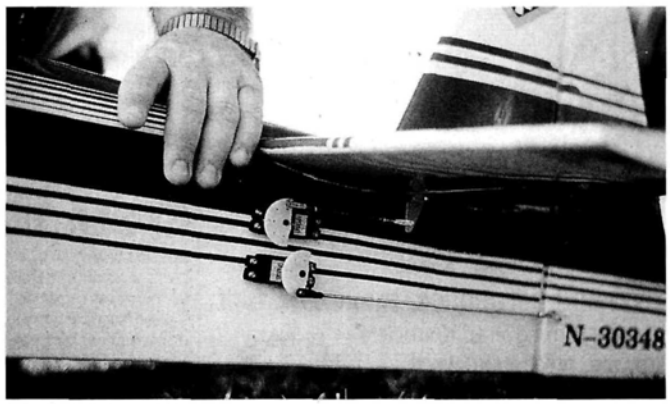
For throttle, I start with a good ball-bearing sport JR* 531 servo and an 1/8-inch Sullivan* flexible Nyrod with a Sullivan clevis at the servo end and a 2-56 ball link at the carb end. Keep in mind that for consistent response, throttle linkages should be just as tight and neat as those for the elevator.

For aileron, I start with a medium-power (90 to 100 oz.-in.) JR 4131 ball-bearing servo and a threaded 4-40 solid rod with a Sullivan clevis at the servo end and a Robart clevis and ball-bearing horn (at least 3/4 inch long) at the surface end. After I've tested the setup, I solder both ends to eliminate the need for jam nuts.

I use the same type of servo for the elevator, but I use the large, 3/8-inch Sullivan Nyrod with 4-40 rods at both ends. I again use a Sullivan clevis at the servo end and a Robart clevis and ball-bearing horn on the surface (again, at least 3/4 inch long), and once again, I solder both ends.

For ease of installation and setup, I always separate the rudder and tailwheel (or nose wheel). Using one servo for both usually causes one or the other to be short on throw or reversed on both. Because the rudder is the largest control surface and the tailwheel takes a lot of abuse, I use pull/pull on both. By doing that, I ensure that they're solid and tight in both directions, and I can get maximum throw in both directions, too. The Sullivan clevis with rod and eye ties off the cable on the servo end, and I use a ball link at the surface end and drill through for the cable tie. I use the same setup for the tailwheel, with the exception that, at the servo end, I use a small, 1-inch-long, no. 2 coil spring for each cable to provide some flexibility and to eliminate cable stretching.

Strong, solid servos are needed for the flap system, and pushrod geometry must be identical on both sides. Always use one servo for each section; having several flap linkages is a geometric nightmare. A surefire way to simplify the geometry is to use a reversed servo (available from JR) on one side. This allows the same side servo rotation and keeps the pushrod lengths identical. I use a JR 4721 (120 oz.-in. torque) with a straight, 4-40 rod and the longest horn the wing thickness will allow. Maximum leverage is imperative here. The flaps need to have good authority; if they don't, they can easily become asymmetric, i.e., they don't come down the same distance, and this is no fun!



Most IMAC and TOC airplanes are set up in this way: externally mounted servos and short, heavy pushrods. Although it isn't pretty, it's great for 100-percent power transfer, and it's easy to check.

HINTS

• When you solder a clevis that is threaded on, use extra flux to make the solder flow into the threads; don't let the solder build up on the end. Heat the joint only long enough to do the job: too much heat will weaken the steel clevis.

• Nyrods should be supported well—usually at both ends and at least once in the middle. Also, never allow any of the inner (plastic) rod to exit the outer tube; always have steel rod exiting the tube to the link.

• Before you glue the Nyrods into place, scuff the surface with 80-grit sandpaper to give the glue some bite. This is usually the only place I ever use epoxy in construction because CA doesn't stick to plastic.

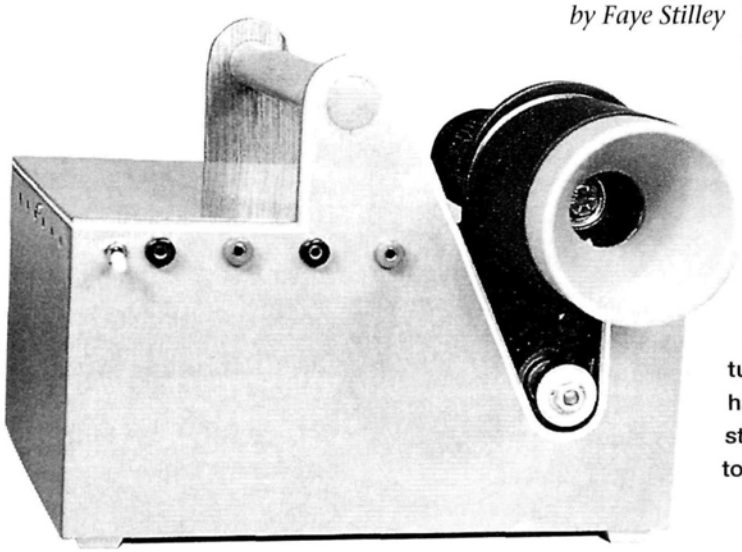
• Clevis and servo-arm connections are often sloppy because of the difference between the clevis-pin's diameter and the factory-drilled hole. To eliminate this slop, carefully measure the clevis pin, then drill your own hole in the servo horn to match the pin. It's amazing how tight this connection can be and just how much slop there often is to begin with.

Being connected safely and securely isn't weird science; it's just good, common-sense mechanics.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

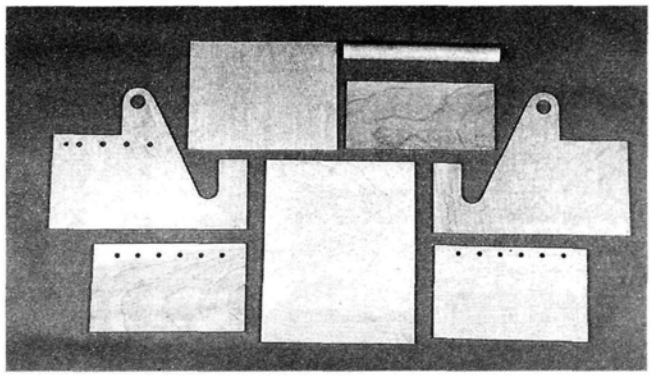
Make a 12- or 24-volt Starter Box

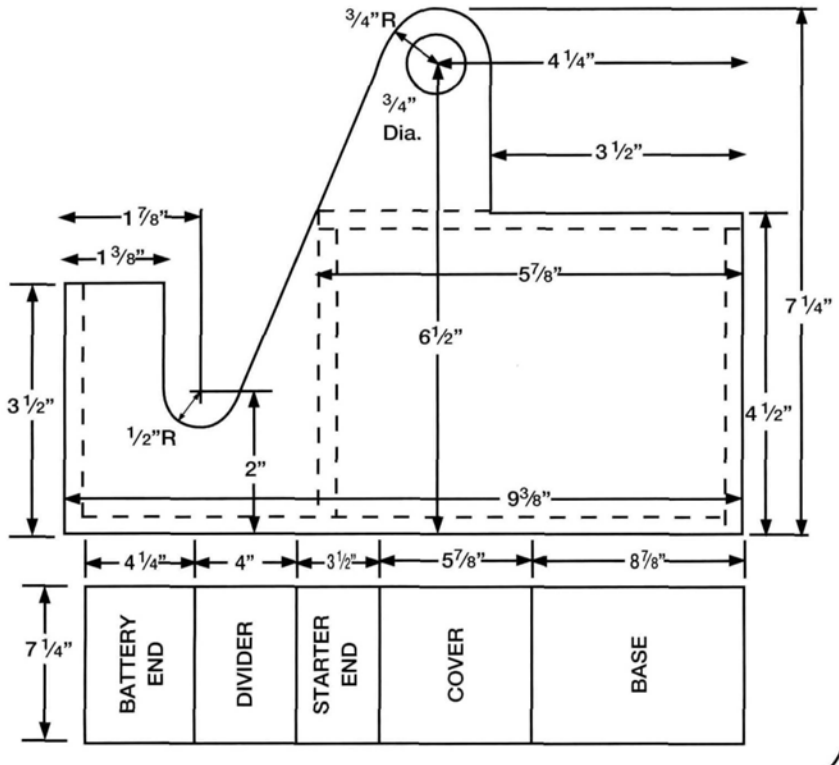
by Faye Stilley



BIG AIRPLANES with big engines usually need a lot of starting power. Most of us are strong enough to turn over the big engines by hand, but a leather glove won't provide protection from much more than a mosquito bite. Running on 24 volts, the Sullivan* Dynatron starter produces 1.5hp, and when coupled to a Miller R/C* Persuader reduction drive unit, it will create enough power to turn over even the crankiest engine without endangering your hands. However, carrying two 12V batteries and a double-size starting unit is difficult without a compact storage container. This tote has a handle and a footprint smaller than this magazine page.

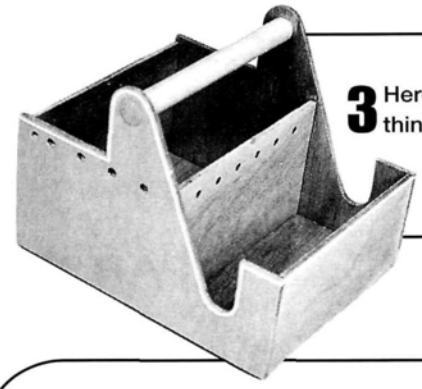
1 The tote is made with only seven pieces of 1/4-inch plywood and one 3/4-inch dowel. The two pieces at the top edge will enclose the battery and have a uniform row of ventilation holes that allow heat to escape. Both side pieces are drilled for the dowel handle, and one has holes for the banana-plug jacks and switch. The other three pieces will make up the box floor, the battery compartment and the cradle end of the tote.



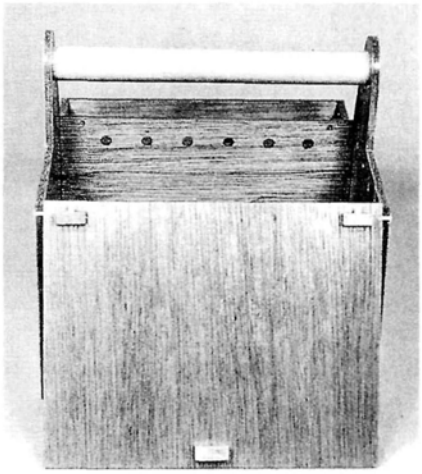


2 For simplicity, all of the plywood parts are 7 1/4 inches long. Set the saw, and cut blanks for all of the parts at one time. Note: if you are using imported plywood, it is probably 6mm thick instead of a full 1/4 inch (6.35mm). If so, only the length of the floor and the height of the divider and battery end need to be adjusted; all of the other measurements can remain the same. Drill 1/4-inch holes in the divider and battery end piece above where the tops of the batteries will be. Their placement isn't critical, but they are necessary to provide good ventilation. The holes in the side panel should fit whichever banana-plug jacks and switch you choose.

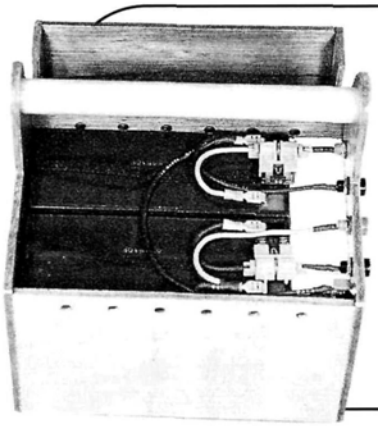
Portable Power



3 Here, the tote is assembled and ready to be wired. It is important to keep everything square during assembly, or the battery cover will not fit properly. A good wood glue or epoxy will hold things together just fine. Of course, screws or nails could be used instead.

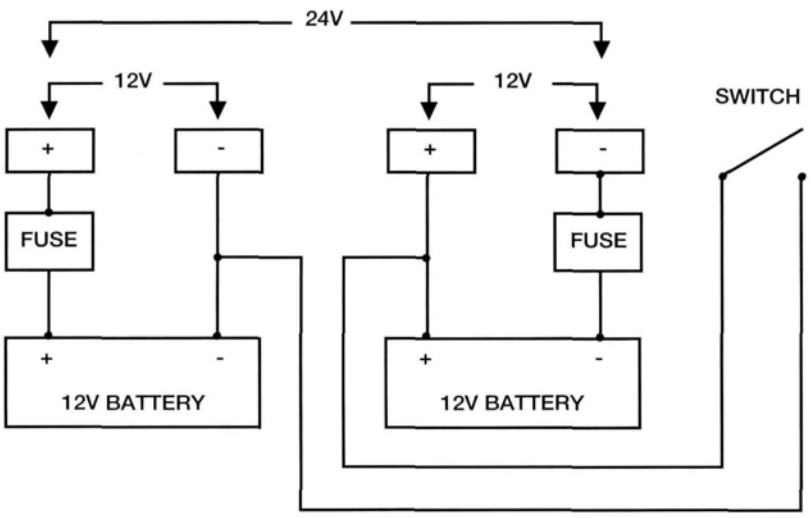


4 Mount the cover using two pieces of ¼x¼-inch spruce, drilled and fitted with ⅛-inch dowels. Note the holes drilled in the divider to accept the ⅛-inch dowels. Finish attaching the cover by putting a screw through the battery end of the tote and into a piece of ¼-inch-square spruce on the other side of the cover. Aside from screws, the cover can be secured in any number of ways, except with hinges; the handle will interfere with the operation of a hinged cover. The handle location shouldn't be changed because it's at the tote's center of balance.

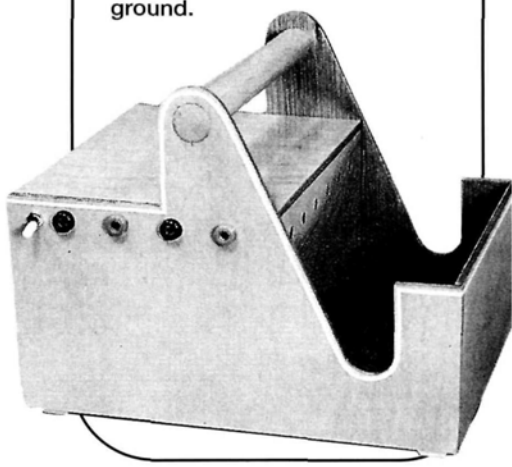


5 Here, the batteries and wiring have been installed. Wedge a piece of Styrofoam below the banana-plug jacks to hold the batteries in place. Each battery is protected by a 30A automotive fuse. The "clamp-on"-type fuse holders are available at most automotive supply stores. If the fuses you buy come in a plastic bag, there is room to carry an extra supply on the top of the batteries. If they come in a metal tin, carry them somewhere else, such as the starter cradle.

6 The wiring is straightforward. You basically have two 12V power supplies that are wired so that each can be charged separately with an ordinary 12V charger (with the switch in the "off" position). Turning the switch on simply puts the batteries in series, providing a 24V supply. Note that the fuses protect the batteries when they're in series and parallel. Be sure to choose a switch with an amperage rating that's higher than that of your batteries.



7 The tote is ready. For 12V operation, plug the starter into the first set of jacks. The second set of jacks provides a 12V backup. When you need 24 volts, plug one banana plug into the first jack and the other into the last jack, and flip the switch on. This tote is "ambidextrous"; the starter unit can be carried in the cradle facing either side. Here, it is ready to be used on your left side, making it convenient for "lefties." I added rubber feet to keep the tote off the ground.



**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

PRODUCT WATCH

Editors' picks of the month

AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we try it out first to bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

CACTUS AVIATION

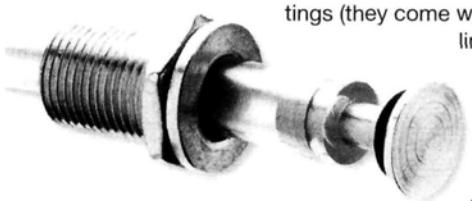
EZ-Filler fuel caps

Faster Pit Stops

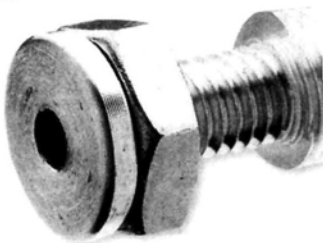


There comes a point in every modeler's life at which his airplanes not only have to fly well but they also have to look good while doing it. One really easy way to improve the appearance of your models is to pay attention to the little details and make everything look as neat and as professional as you can. The EZ-Filler fuel-cap package does a great job of improving your model's appearance and makes refueling a lot easier.

The EZ-Filler combo pack incudes an aluminum filler tube, cap and vent fittings (they come with jam nuts to secure them) and a plastic fuel-line T-fitting (for gasoline). You can use a two- or three-line fuel system with the EZ-Filler; just drill a fuel-line hole in the cowl or fuselage. With a three-line system, you attach the tank's outlet tube to your carb and the vent line to the vent fitting on the bottom of the model, and you mount the filler tube above the tank centerline. Typically, I install the filler tube in the top center of the cowl or in front of the canopy.



To make refueling even easier, cut the filler line 4 or 5 inches longer than usual so that it can be pulled through the filler tube. The filler cap has an O-ring that allows it to fit snugly inside the filler tube and is simply pushed into the filler line to seal the fuel system.



For gasoline engines, you can use a two-line system and add the filler tube and cap to the outlet line with the T-fitting. Gasoline engines have pumper carbs, and the T-fitting allows you to fill the tank without flooding the engine. It takes more than 8psi of pressure to open the diaphragm pump, so you can use any mechanical fuel-pump system without fear of drowning your engine.

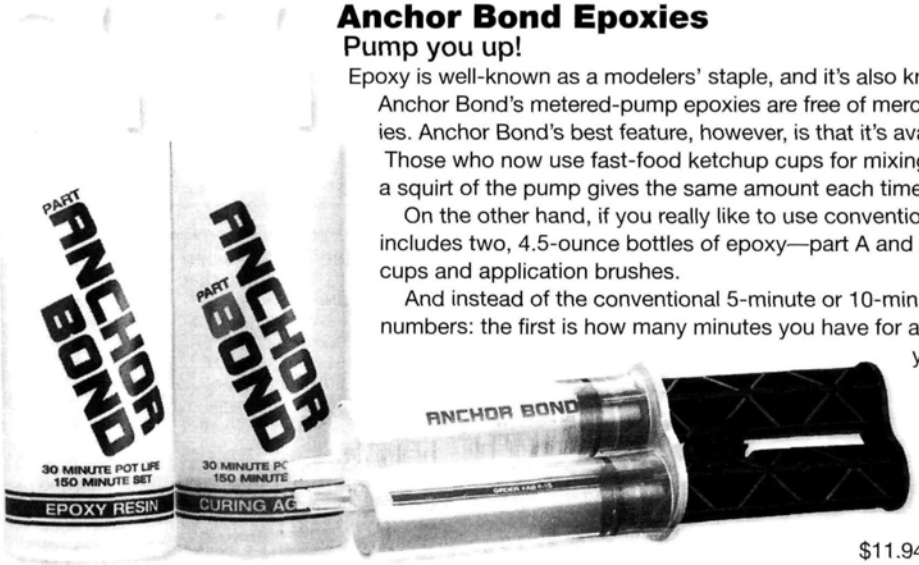
In use, the EZ-Filler lives up to its name—easy to install and use—and I think it really improves the looks of my models. For efficiency (no more loose fuel lines flopping around in hard-to-reach places) and good looks, try the EZ-Filler Gasoline Combo for $10.50 ($6.75 for a Single EZ-Filler tube). *—Gerry Yarrish*

Cactus Aviation, 10380 E. Heritage Place, Tucson AZ 85730; (520) 721-0087; www.pclink.com/cactus.

ANCHOR SEAL

Anchor Bond Epoxies

Pump you up!



Epoxy is well-known as a modelers' staple, and it's also known to be messy and smelly at times—until now. Anchor Bond's metered-pump epoxies are free of mercaptan, the stinky ingredient in conventional epoxies. Anchor Bond's best feature, however, is that it's available in metered pumps that eliminate the mess. Those who now use fast-food ketchup cups for mixing two-part epoxies will love these pumps because a squirt of the pump gives the same amount each time.

On the other hand, if you really like to use conventional mixing cups, buy Anchor Bond in a kit that includes two, 4.5-ounce bottles of epoxy—part A and part B—and several mixing sticks, measuring cups and application brushes.

And instead of the conventional 5-minute or 10-minute setting times, Anchor Bond labels give two numbers: the first is how many minutes you have for application; the second tells how many minutes you have to make minor adjustments to the positions of the parts being joined. The metered pumps are available in these time combinations: 4-15, 5-30, 8-90, 30-150 and 45-270.

My Anchor Bond went on smoothly, but be warned that the epoxy left in the mixing pot will get uncomfortably hot when it hardens. It costs $11.94 for a kit and $10.94 for refills, so try Anchor Bond on your next model; your workbench and your nose will love it. *—Geoff Cozine*

Anchor Seal, 16 Riverside Ave., Danvers, MA 01923-3281; (800) 669-5217/(978) 774-5217; fax (978) 774-0638; anchorseal@aol.com.

FMA DIRECT

ChargeAll

Multi-task battery charging

Most field fast chargers will charge your transmitter and receiver batteries, but what about your glow driver? Well, that once required another piece of equipment, but now, hooked up to a 12V DC power source, ChargeAll will charge these simultaneously, and since this little powerhouse is also peak detecting, there's no need to baby-sit it.

The concise directions explain charging and charge rates and include appropriate warnings. There's a barrel connector for transmitters but none for a receiver pack. A variety of connectors is available from FMA, but I just used an aileron extension for my charging jack. I coated the bare wire end of the extension with solder so the wires would not fray under the pressure of the wire clamps.

A 12V power source that's capable of at least 10 amps of consumption is recommended. A car battery or 12V field-box battery will work fine. I'm getting interested in electric flight, so I bought one of the portable power supplies used to jump-start a car (the type that's readily available at automotive stores). Charging time will depend on the state of your battery.

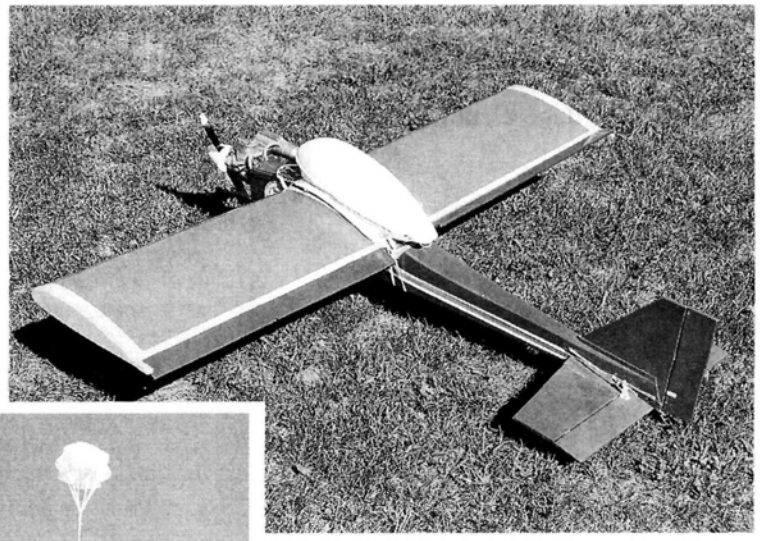
Using one source for all your charging needs is very convenient and helps save space in your flight box. —*Craig Trachten*

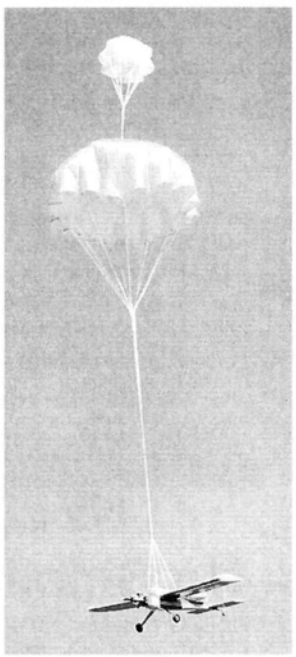
FMA Direct, 9607 Dr. Perry Rd., Unit 109, Ijamsville, MD 21754; (800)343-2934; fax (301)831-8987; www.fmadirect.com.

SPECIFICATIONS

Size: 6.5x3.5x2 in.
Weight: 1 lb.
Input
12V DC via alligator clips
Output
Receiver pack: 4 to 7 cells, variable rate of 0.5 amp to 4 amps
Trickle-charge: 15% of set charge rate
Transmitter pack: 6 to 10 cells, fixed rate of 1 amp
Trickle-charge: 80mAh
Glow driver: 1 cell; fixed charge rate of 1.2 amps at 20 min.
Readouts: ammeter, power, charge and trickle LEDs
Power supply: 12 volts; capable of at least 10 amps of consumption
Protection: 10A auto fuse and polarity protection







WILDCAT FUELS

Para-Cat

Rip-Cord Rescue

Geronimo! The Para-Cat brings the technology of R/C parachute recovery to your .40- to .60-size high-wing and shoulder-wing models. Although it isn't intended to replace an instructor, it is an effective way to protect your investment.

A little assembly is required: you'll need scissors, a drill, a standard servo and some thin and thick Zap. The instructions and photo illustrations clearly guide you from cutting out the vacuum-formed components to the packing of the big, 70-inch-diameter chute.

Attach the parachute's 250-pound-test lines to the plane's wing dowels and the Para-Cat's base to the top of the wing with rubber bands. A shutdown module automatically turns off the engine when the chute is activated.

To operate the Para-Cat, all you'll need is an unused radio channel; on radios with five or more channels, use the retract switch to conveniently activate the chute. An onboard servo releases the Para-Cat's hinged clam-shell top; a 2-foot-diameter drogue chute pulls out the main, 70-inch-diameter chute; and a "shock ring" on the shroud lines prevents the harness from yanking out the wing dowels. This allows the main canopy to deploy without unduly stressing the airframe.

I attached the Para-Cat to a Lanier Fun-Fly. Nestled on top of the wing, the unit in no way upset its flight characteristics. While flying at about 100 feet at a moderate throttle setting, I hit the switch with much anticipation. The chute deployed, the plane decelerated rapidly as the parachute opened, then it arced skyward before settling into a safe descent—all in fewer than 2 seconds.

I tried several more drops with equal success. Senior editor Chris Chianelli didn't want to be left out of the fun and really tested the Para-Cat's mettle with a surprise deployment while flying full throttle at an altitude of 30 feet. I'm happy to tell you that the unit operated flawlessly and is effective even from this altitude (luckily for Chris). For $79.95, it's a cheap insurance policy, don't you think?

A larger Para-Cat to handle planes of up to 50 pounds will soon be available. —*Bob Hastings*

Wildcat Fuels, 3005 Park Central, Unit T, Nicholasville, KY 40356; (888) 815-7575/(606) 885-5619; fax (606) 885-8549; www.wildcatfuel.com.

Manufacturers! To have your products featured here, send them to **Model Airplane News**, attention: Product Watch, Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606 USA.

MODEL AIRPLANE NEWS CLASSIFIEDS

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"AM I IMPRESSED? YOU BET!"—review, *Model Airplane News*, November 1998. MINIATURE PLUNGE ROUTER BASE AND TEMPLATE GUIDE BASE. Version for Dremel, Ryobi, Foredom. Unprecedented accuracy and smoothness of cut. Bishop Cochran, http://www.bishopcochran.com; (503)231-5694. [4/00]

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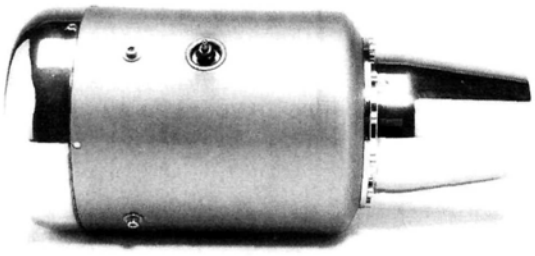
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Continued from page 47



The RAM 750F turbine produces 18.5 pounds of thrust at 120,000rpm yet is one of the most user-friendly turbines available.

Larry Wolfe at JHH still offers plan packs and semi-kits for several designs. Most of his designs feature a fiberglass fuselage and a set of plans for the modeler to use and cut out his own wooden parts. Presently available are an F-4, A-4, F-86 and a Cougar.

One of the newer kids on the block, so to speak, is Jim Dyke's Air Magic*, which offers a few scale kits, the most popular being the F-15 Eagle in ducted-fan or turbine version. The F-15 just may be the most forgiving, easy-to-fly scale model jet in the country today. Fast? NO! Stable? DEFINITELY! Air Magic has also just introduced a new line of jet landing gear.

I apologize in advance if I have forgotten any other United States kit manufacturers, but I just can't think of any others at this time. I do know of a superb flying Panther jet designed by Nick Ziroli* that's available as a plan and from custom kit cutters. A fiberglass fuselage may be available for it soon, but for now, it's an all-balsa airplane that flies fabulously.

And even though it isn't a true kit company, I would be remiss if I didn't mention Glennis Wheels* as a source of custom-manufactured wheels, tires and brakes for any unusual subject. And don't forget Pro-Mark* and Aeroloft* for dry-transfer style lettering and artwork. There are differences between the products of the two companies, but both offer attractive art for the side of your scale model. From what I have used personally, the biggest difference may be that Pro-Mark's stuff is fuelproof and solvent-proof.

Before I close this article, I'd like to clarify one thing: people who don't know jets sometimes think that they are built for just one thing: speed. This is absolutely not true. It is most important that we all understand that jet modelers prefer jets for the same reasons as some other modelers may prefer biplanes, racing aircraft or World War II fighters. We all try to fly jets responsibly. We know that they are capable of 3-miles-per-minute speed and more, but we rarely open them up to experience this. Most of us fly at ½ throttle or less, never letting the model escape our comfort level in distance. It's very important that the speed aspect of jet modeling not be the most important. For the dedicated jet pilot, it certainly is not!

With that said, I hope I have done a reasonable job explaining why jets are so popular, why jets have become so reliable and which companies offer merchandise you might be interested in. I know that this jet market is far larger than most of us comprehend. Along with the larger companies I have mentioned are many tiny ones, all over the world, that make just an item or two. But, big or small, all the stuff in the "jet world," in my opinion, is truly neat!

Give a jet a try. If you take your time and listen to those with experience, you won't be let down; I promise you.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

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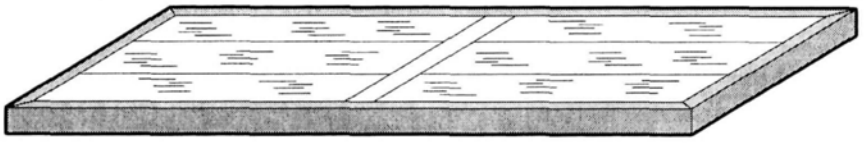
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The winner will be chosen four weeks following publication from correct answers received (delivered by U.S. mail) and will receive a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner's subscription will be extended, free, for one year.

We congratulate Dan Crase of Carden City, KS, for identifying the September '99 mystery plane: the W-10 Wittman Tailwind. Tailwinds, including the W-8 and W-10, will carry two people and 60 pounds of cargo. Around 1,100 sets of plans have been sold since the creation of the Tailwind in 1953, and nearly 375 complete Tailwinds exist today. The W-10's fabric-covered fuselage is constructed with 4130 steel tube, and the wings consist of spruce and plywood. With a length of 19½ feet and a wingspan of 24 feet, the Tailwind has gentle stall characteristics and is very stable. In about 2,500 hours of building time (and about $8,000 before engine and avionics), you could own a piece of history.



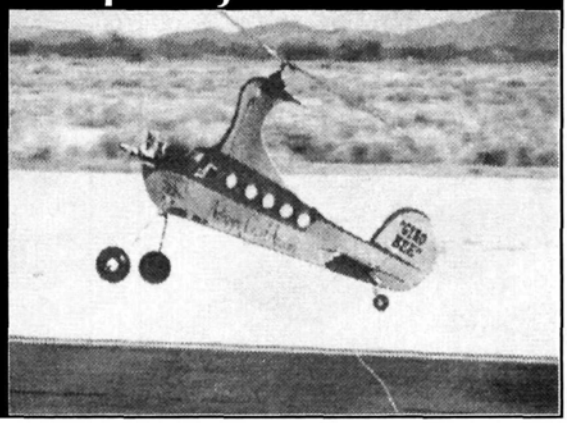
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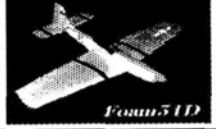
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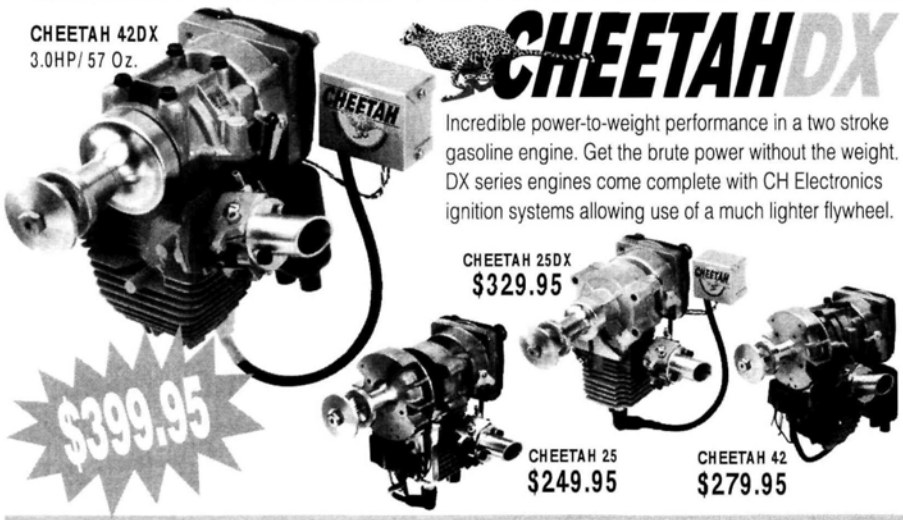
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Periodical postage permit paid at Ridgefield, CT, and additional mailing offices.

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BY MAYNARD HILL

Cross-country R/C through nine tunnels

There are nine tunnels between the cities of Turin and Pedaso in Italy. Gian Aghem, an Italian aeromodeler and famous record-buster, set a world record for cross-country distance with a piston-powered R/C model by chasing his model through them in a convertible. This was Gian's 16th FAI world record for aeromodels. As the crow flies, the distance—which is what counts—is 546 kilometers (339 miles); the curving road is about 390 miles long.

This part of Italy, which runs along the Adriatic Sea, is not mountainous but somewhat corrugated, like a washboard. The highway engineers decided it would be cheaper to bore tunnels through the hills than to build a serpentine route full of horseshoe curves to surmount the steep 200- to 600-foot slopes.

So, how was this tunnel stuff done? When the FAI rules committee decided to allow an assistant pilot to relieve the chief pilot during cross-country flights, Gian snapped to attention. His 15-year-old son, Marco, was already a highly skilled R/C pilot who had won first place in the Italian R/C Glider and Electric Championships two years in a row. Now he could beat Australian Peter Garoni's record, which—not to diminish Garoni's achievement—occurred over much easier topography. Garoni flew his record flight in the south-central region of Australia known as the "Null Arbor Plain." That translates to "No trees!" What's more, there is nothing there besides sand, and I am told that there is a road nearly 200 miles long, straight as an arrow with no hills! Paradise for cross-country R/C!



The happy crew after a successful landing in a pasture just outside the city of Pedaso. Left to right: Rosella, Marco and Gian Aghem; Marco Rossaro, directing official, and observers Mario Carletti and Lillo Condello.



Tunnel no. 9 under the highest hill of the trip. It is about 500 feet high at midpoint.

Gian gathered a crew of three people for each of two cabriolets (Italian for convertible). The driver and radio communicator of each car did double duty as official observers. For the flight's first 250 kilometers, Gian piloted the plane along the highway from Turin to Bologna, a road he had used a year earlier to set the record that Garoni broke. In that earlier record, he had flown northeast out of Bologna. He couldn't use that road this time because in addition to some badly mountainous territory, it reached the border of Yugoslavia short of the distance needed to set a record. So, out of Bologna, the party turned southeast on the Via Pasedo Highway.

At the first tunnel, Gian's driver stopped on the berm outside the entrance. Gian circled the model overhead, while Marco's driver proceeded through the tunnel and stopped on the berm on the other side. As soon as Marco established radio contact, Gian flew the model over the top of the hill as far as was safe for him to visually control it. As soon as Marco saw the model, the teams counted down to switch off Gian's transmitter and switch on Marco's. Marco then flew the model down from the top of the hill and circled overhead until his dad's car came through the tunnel. Then they counted down again and switched again before rolling on down the highway to the next tunnel. They repeated this nine times. What fun! What excitement! What risks! One bad radio command or traffic jam, and all would have been lost. This R/C hand-off might be easy when you're standing next to each other at the field, but try it using only radio contact over ½ mile away! It is nerve-racking and hazardous.

This record-breaking flight started at Turin at 10:25 a.m. and ended at the predesignated spot near Pedaso at 5:18 p.m. The car's ground speed was between 54 and 68mph (90 to 110kph). There was only a little wind, mostly from helpful directions. Some of the tunnels were curved inside the hill, so Gian sometimes had to park the model in orbit not dead ahead of the entry. In the order encountered, here is a listing of the length of all nine tunnels: 640 feet, 320 feet, 480 feet, 960 feet, 1,440 feet, 960 feet, 2,950 feet, 700 feet and 2,560 feet. To pass all these obstacles with no foul-ups was a remarkable accomplishment. You almost forget that the model had to keep going for seven hours of regular flying!

The Aghem family team's record has since been surpassed: once by Ron Clem of California (427 miles), once by my team (457 miles) and again by Ron Clem, who holds the current record at 517 miles. The Aghem family team would doubtless like to overtake Ron Clem, but as Gian says, this is impossible in Italy. The next tunnel down the road from Pedaso is 4.5 kilometers, or 14,400 feet long. No human eye can see a model well enough to pilot it from a distance of 7,200 feet—3,000 feet is stretching it for most sharp-eyed pilots. There are probably no other similarly tunneled roads anywhere in the world, so it is quite safe to say that the family's nine-tunnel record will never be broken!